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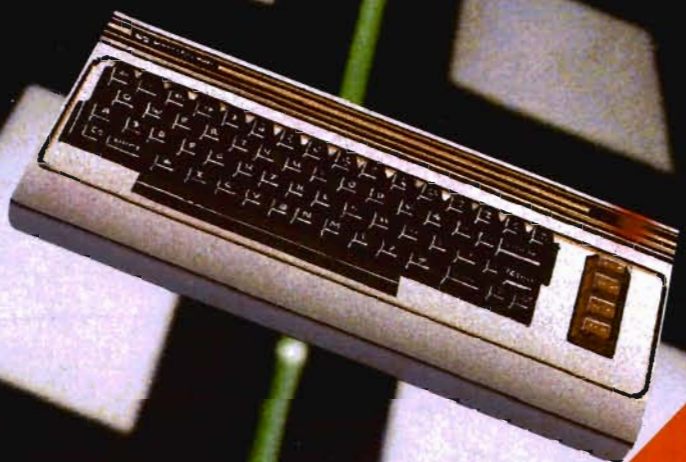

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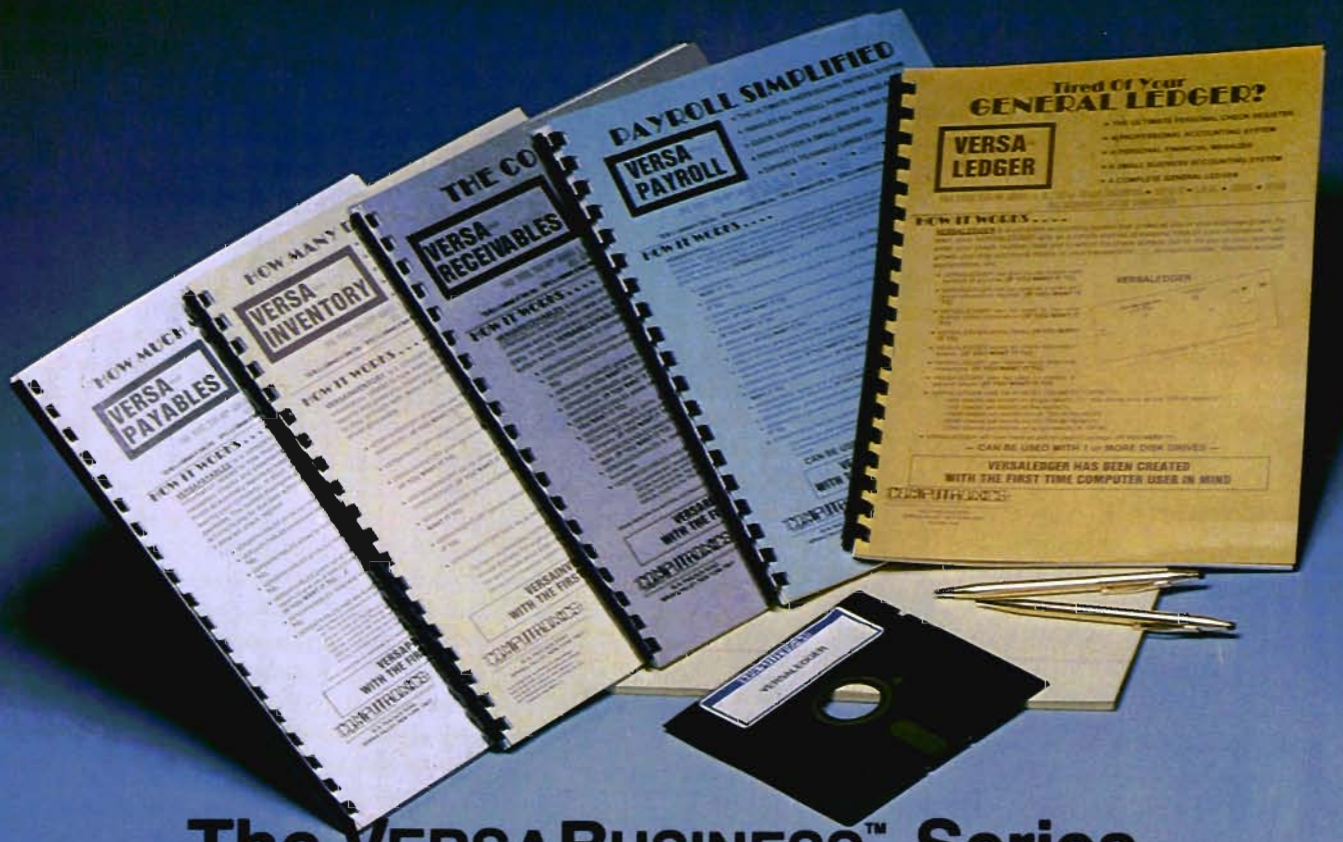

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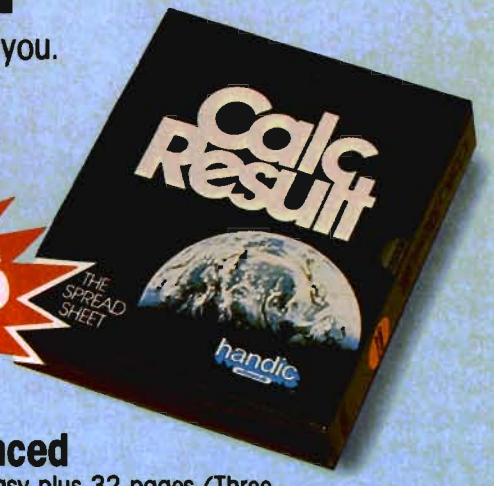

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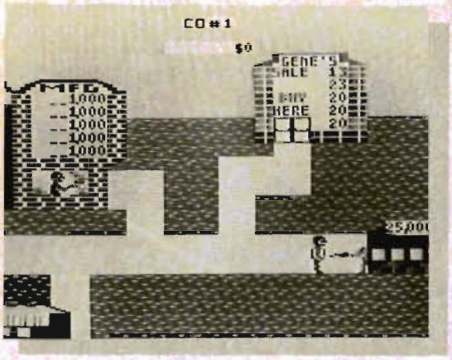

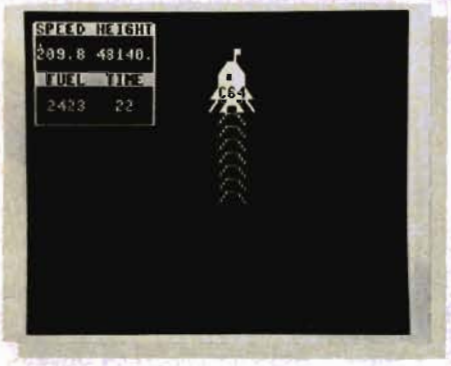

This month's "Best of Volume 1" cover suggests that Commodore computers are on the right track, as long as they stay on the ball.

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THE "LAST" SCHOOL

Perhaps your children, like mine, have had the opportunity to work with microcomputers at school. But how much "hands on" contact do they get? Except for a few particularly affluent or advanced places, the typical American student is probably lucky to receive as much as one or two hours of computer access each month.

If the current trend of computer acquisition by school systems continues, however, it may not be long before computers become the standard medium of education delivery. We will know when that time has come when "keyboarding" replaces "penmanship" as a basic skill, and children carry "disk packs" instead of "book bags."

The computer juggernaut is forcing our educational system to face a number of monumental issues and challenges. In the short run, school districts are grappling daily with decisions about how best to allocate their budgeted computer funds. As suggested by an article in this issue which compares the IBM PCjr with the Commodore 64, the higher cost of those "edible" brands (i.e., fruit or nuts) may pay off more in prestige value than functional utility. In other words, if a superintendent or principal has $5,000 to work with, will the students be served better with 10 C-64 systems or only 3 IBMs or Apples?

Another trend that might threaten the stability of our educational establishment is the rapid increase in home computers. The fact that educational use is a prime motive in computer purchases by many families may reflect a general dissatisfaction with the traditional, institutional mode of education. Although the present incompatibility among brands and models often prevents a student from working on school computer assignments at home, the development of software standardization should allow for easier transfer among the various locations where education can occur.

One of the most serious questions facing our schools is whether computers will eventually eliminate the need for most teachers and centralized learning centers. In a sense, the present system of one teacher for each 30 or 40 students is extremely inefficient and open to wide variations in quality. By extracting the best aspects of a one-on-one, interacting teacher in an easily reproducible form, educational computer software promises to foster learning in a way that embodies more uniform standards of excellence, tailors itself to the individual strengths and weaknesses of each student, and sharply reduces the cost of human resources in the educational delivery system. Since children seem to be spontaneously attracted to computers wherever they are found, the need for the rigid physical and bureaucratic structures of schools may become unnecessary. Yet, there is still value in the socialization that takes place in group educational settings. My best guess is that schools will still exist throughout the computer age, but that their organization and appearance will evolve to be as different from today's structures as today's are from the one-room schoolhouses of the past.

In the meantime, I hope you become familiar with the possibilities of computer education through the pages of *COMMANDER* and other publications. Then judge for yourselves what the future holds.

Don Elman

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Colin's Column

REVIEWS, PREVIEWS, NEWS and VIEWS

By Colin F. Thompson

Those of you who have been reading this column for some time realize that I review only the best of all the available software and hardware. I do this with your best interests in mind. You should not have to spend months picking a few diamonds from a field of rocks. I mention this elitist policy as a way of introducing myself to the Commodore 64 owners who will now find something to read about in these pages.

C-64 SPOKEN HERE

Welcome aboard, but fasten your seat belts because we are about to take a few fast laps in a hot, new import.

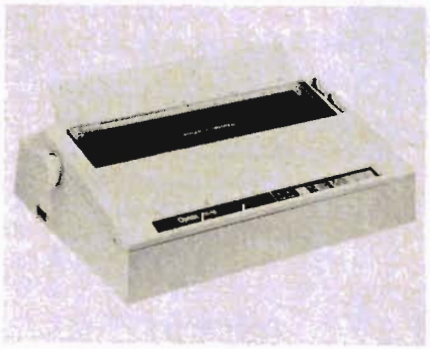
I have finally graduated from the ranks of dot matrix printer users into the realm of letter quality (LQ) printing. I waited three years to take the plunge. The reason? The good printers were too expensive and the rest were clunkers. Things have a way of changing for the better, so I patiently waited until the printer manufacturers of the world could deliver the printer of my dreams for less than $1000. The wait is over.

I really didn't want much. Just a LQ printer that printed perfectly formed characters in 10, 12 and 15 pitch, at a speed I could live with. Of course noise is an important factor also. My dream printer should be no noisier that an IBM Selectric Typewriter, and of course the paper should load automatically. It should also have all the important controls on the front, for easy access, and the ribbons must be inexpensive and readily obtainable. Naturally, my favorite word processing program would be able to send all the standard codes, and the printer would understand them. For those big printing jobs, a cut sheet feeder should snap into place and automatically feed one sheet after the next for a completely "hands off" print run. Finally, I think the printer should have a typewriter keyboard of its own, so that in the off-line mode it could function as an intelligent, correcting typewriter. Now I ask you–is that too much to expect for less than $1,000?

If you could see the smug look on my face, you would know the answer.

BUT WAIT, THERE'S MORE

Lots more. Lest you think I have taken to writing science fiction, the printer that finally passed my rigorous qualifications is the Dynax DX-15. Before we get deeper into the inevitable "tech spec" discussion, you should know that the cost of the basic printer, without the geegaws, is $600 retail. Through careful shopping, you will probably find the actual selling price to be about $525. The optional keyboard is $200 list and the cut sheet feeder (I'll explain that later) is $250. It requires a printer interface ($50-$120) to be hooked up between your C-64 or VIC-20 and the printer. This is normal with most printers and should be considered when you add up the total cost of purchase. The DX-15 is available with a Centronics parallel or RS-232 serial interface.



CPS, CPI, ETC.

CPS means Characters Per Second. It is a rough gauge of printing speed. Most dot matrix printers run at 100-160 CPS–but at a cost: print quality is legible but does not look like a typewriter. The other side of this trade-off is the LQ printer. The affordable ones lumber along at an unremarkable 6-15 CPS–but they eventually produce copy that looks typewritten. Where does the DX-15 fit in?

It is fast by comparison to previous LQ printers, and prints as clean as any printer I have ever seen or used–including the $3000 Diablo. CPS is a poor measurement of printing speed. A better yardstick would measure the time it takes to print the "standard" one-page business letter. This method will reveal true printing speed. The DX-15 and my Smith Corona are rated at the same 13 CPS, but the DX-15 prints the business letter twice as fast.

Yes, they both print at 13 CPS, but the Dynax is bi-directional and logic seeking. These two features are standard with all good dot matrix printers, but are rarely seen on LQ printers with a $600 price tag. Bi-directional printers do not automatically return the carriage to the left margin to begin each new line. They print from left to right or right to left, whichever is faster. Logic Seeking is a computeroid term of endearment, used by those who know its meaning in order to confuse those who do not. It is really very simple. When the printer is finished printing each line, it peeks at the next line to see what is to be printed. The printer then calculates whether it could print the next line faster by moving the print head to the left or right of its present position. This saves time, and thus improves the true printing speed.

Another way the print speed is increased is by moving the print head with a stepper motor and wires, rather than bumping it along one position at a time with a ratchet. The Dynax will tab from the left margin to the right margin in a fraction of a second. Not so with my TP-1. It takes more than 5 seconds for the same tab operation.

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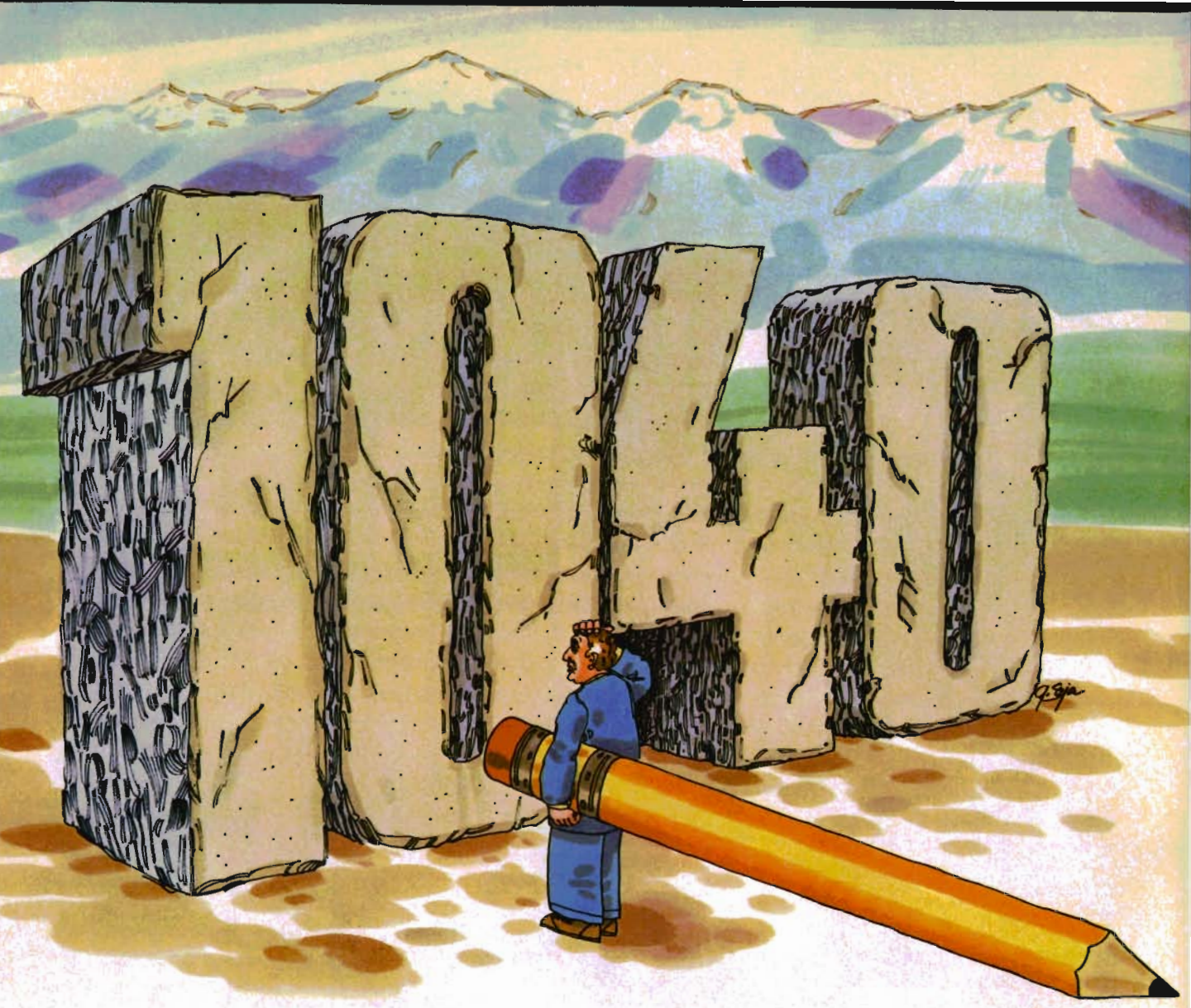

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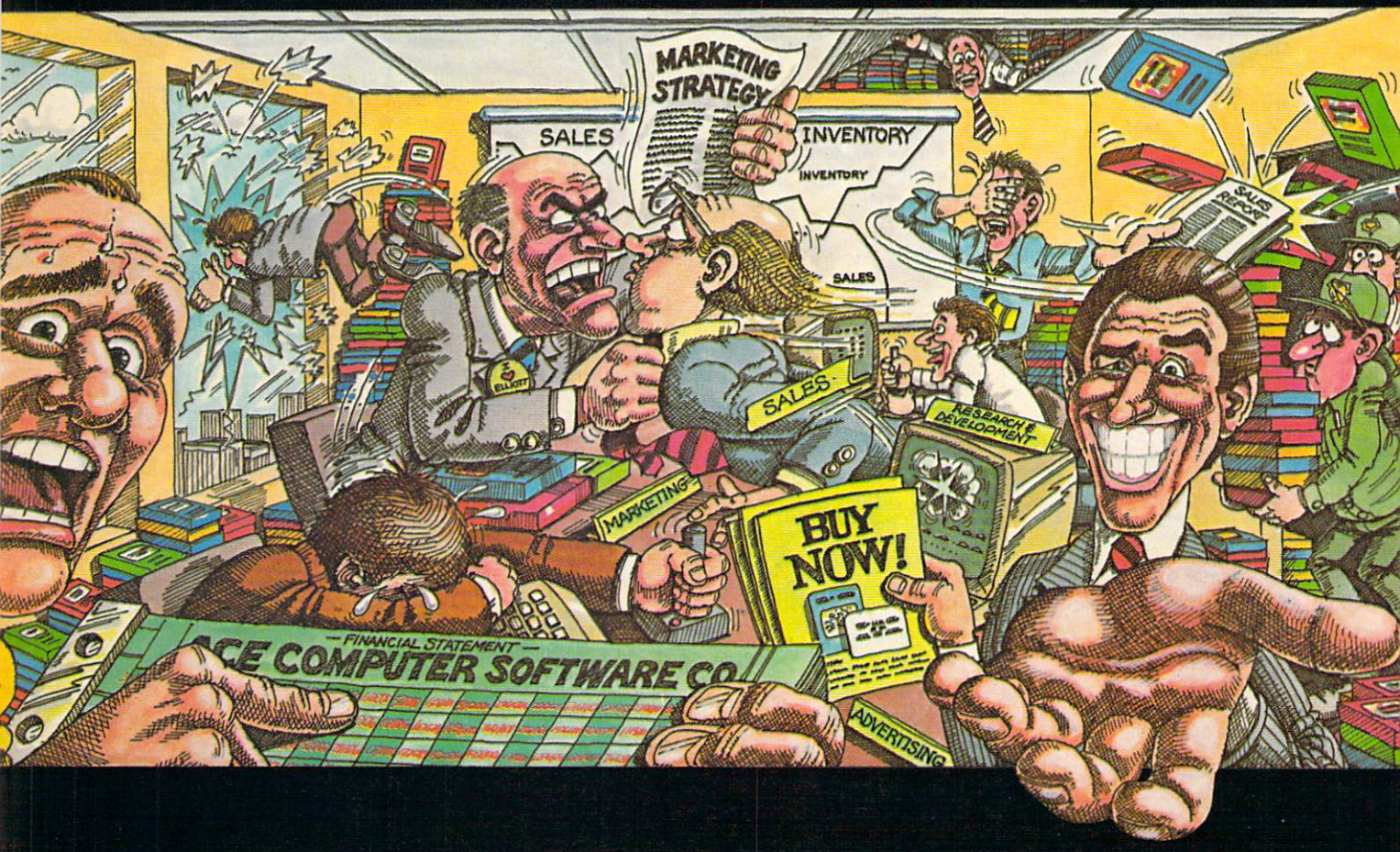

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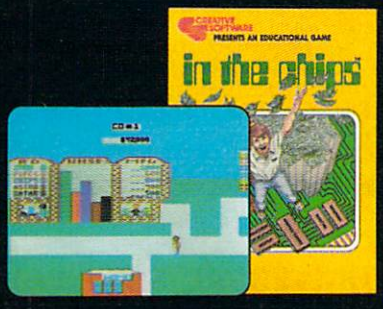

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BELLS AND WHISTLES

The Dynax's front panel is a functional work of art. A row of six touch-buttons allows you to control the printer with one finger, instead of sending special codes from your software. You can select the pitch–Characters Per Inch–or the line spacing with only a touch of a button. These features, placed on buttons, should be on every printer, not just the best ones. The usual Top Of Form, Line Feed and Select buttons are there also. The sixth button is unusual. It is the Copy (a page) function. When you press Copy, the printer prints the page as usual, but also keeps the page in its 3K memory, allowing you to print it again (and again). It is a nice touch (pun intended).

Loading a single sheet of paper is a simple, automatic operation. Just place the blank page in the printer as you would a typewriter, and press the TOF button. The page rolls into the printer, the bail pops out of the way. When the paper stops moving, the bail returns to hold the page in place.

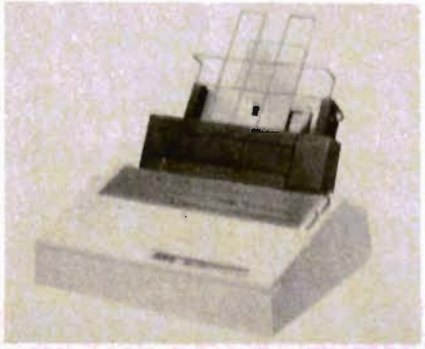
The Pitch button lets you set the pitch to 10, 12, 15 CPI or proportional spacing. Be sure to put in a print wheel that matches. Twelve different print wheels are available. The Prestige 10–12 pitch wheel comes with the printer. The proportional space printwheel will print copy that looks like it is typeset. It is very pretty, but it does not work with a right justified margin. I wish a 12-year-old programming genius would write a program to produce proportionally spaced, justified copy. The printer will do it, but needs a program to tell it how.

The widest from the platen will accept is 13.5". I wish it were 14". Then a legal letter sized page would fit in sideways. As it is, you can print a lot of characters on a line. At 10 pitch, it is 110 characters. Twelve pitch is 132 and 15 pitch is 165. you can print a very wide spreadsheet at 15 pitch. Database reports look good also.

There are two banks of DIP (too small for fingers) switches on the rear of the DX-15. The switches are similar in function to most other printers. They let you set up the printer to match your computer (or word processor). You can select the Language, Line Feeds, Forms Length, Skip Perf and serial interface parameters from the switches. The position of the DIP switches (hidden from sight in the back) leaves a lot to be desired. They should have been placed under the lid, on the front of the printer, like the Transtar 130. Sometimes I need to change the "Line Feed After Carriage Return" switch. Changing this switch from off to on is a dreaded task.

PAPER

This printer is designed to print on single pages of bond (typing) paper. The paper can be long or short, narrow or wide. It will print up to 4 carbon copies at once. Continuous forms may be used, but with caution. After printing a page or two of these forms (or labels), the line spacing will be off. An optional Tractor Feed is available, and should be used for fanfold paper and labels.



The optional Cut Sheet Feeder (CSF) can speed up printing of multipage documents. The CSF is a mechanical device that snaps in place. It holds a stack of paper and feeds one sheet at a time when a Form Feed command is sent to the printer. Printed pages are ejected into a stacker. The idea behind the CSF is sound, but the implementation leave something to be desired. The CSF loads the new sheet into the printer in the wrong place. It puts the left edge of the page at the 10th print position–20 positions too far to the right. It seems like an engineering blunder to me. I can get around this inconvenience by resetting the left and right margins in my word processor, but I shouldn't have to. The CSF is the only piece of Dynax hardware that I have which fails occasionally; sometimes it misfeeds a sheet.

CRYPTIC CODES

Thirty-two different "escape" codes may be sent to the printer. Some of the more interesting ones are print red (more on this later), set margins, auto underline, shadow, heavy, vertical and horizontal tabs, sub/superscript and auto LF on/off. The codes may be sent from your word processor program or from a BASIC program. The coding scheme follows the Diablo standard. If your word processor sends Diablo compatible codes, (like QBF) you have a lot of power at your fingertips.

Consumable supplies like ribbons and lift off tape are easy to find or order. I have seen ribbons as low as $4 each. Ribbon replacement is literally a snap–it is the easiest replacement I have seen. When the ribbon cartridge runs out, an ear piercing shriek comes from the printer.

Now, about "print red". The DX-15 has two ribbons: the usual black and a smaller roll of red. The red is really a red version of IBM lift-off correction tape. If you opt for the optional printer keyboard, you would probably replace the red tape with lift-off tape. Then you can use the keyboard as a correcting typewriter. The keyboard can automatically correct any mistyped character on the line. I really like the keyboard. It has buttons, keys and switches all over it. A real technocrat's dream. I asked a secretary, familiar with the IBM correcting Selectric, to try it out. She gave it a 7 out of 10. The differences are in response time and some embedded codes not found on a standard Selectric. When a key is struck on the DX-15's keyboard, there is a slight delay before the character is printed on the page. The delay was bothersome. The correcting mode is slightly different than that on a Selectric and takes a bit of getting used to.

There is a compatibility problem with the CSF. It does not work with the keyboard. It make me think that the CSF was designed by a different company.

Noise? What noise? It sounds like a very fast typewriter. I cannot run my dot matrix printer late at night–it can be heard (and felt) in the next county. The DX-15 is quiet enough to run at 2 o'clock in the morning without causing complaints from the neighbors.

The user's manual is typical of Japanese printer manuals. The photos and illustrations are well done, but the written instructions are a poor translation. Don't expect much. If you are knowledgeable about printers, the DX-15 manual can be read and comprehended in about 15 minutes, If the DX-15 is your first printer, you may need help. (That's what user groups are for. Join one.)

THE LAST WORD

In the six weeks I have used the printer, I have printed more than 1500 sheets of paper without a printing error or failure. I think it is a solid, well built unit, well worth the money.

BACK UP YOUR BACK-UPS!

If you have a disk drive, you have a problem. The programs recorded on your diskettes can be erased easily, either on purpose or by accident. The best way to avert a magnetic disaster is to record your priceless prgrams on two different diskettes. Then, theoretically, your programs are safe from destruction.

Keep a back-up of any file that is too large to re-type. Diskettes are inexpensive, but, I suspect, your time is not. With that

warning in mind, let us examine the ways to make back-ups of your prized programs.

Never, never use the same disk name and ID for two different disks. If you back up a disk with the disk name"C64 GAMES",01, format the back-up disk with the name "C64 GAMES",02. Notice the different ID numbers. You could also make the names different. This rule is carved in stone: No two disks in the library should have the same name and ID number.

Moving a file from one disk to another can be very simple. You will need two diskettes: the original, which we call the "source" disk, and the back-up disk, which is called the "destination" disk. Before the copy session begins, place a Write Protect Tab on the source disk. This will cover up the square cut notch on the upper right side of the disk, preventing it from accidently being erased. Format the destination disk (with a unique name/ID) by using the disk command, NEW. Remember that the new command will completely erase the diskette. The 1541 user's manual may not be helpful to you, so here is what to type:

OPEN1,8,15,"N0:diskname,ID" [return]

The Disk drive should hum and buzz for a minute and then READY will appear on the screen. Now type:

CLOSE 1 [return]

To check your work, type this:

LOAD"$",8 [return]

When READY appears, type:

LIST [return]

The disk name and ID should appear on the screen with another line telling you that 664 blocks are free. If you see this, the disk has been formatted properly and you are ready to begin copying.

The easiest way to copy files is to LOAD a program from the source disk, put the destination disk in place and SAVE the program. This will work with all pure BASIC programs. The method will not work with any other type of file: sequential, random, relative, user or any pure machine language file. If you want to copy one of these files, some extra software is necessary.

DISK COPY UTILITIES

I am assuming that you have had a single 1541 or MSD drive. Many Disk Copy Utilities (DCU) are available for the VIC and C-64. Most are easy to use and make your copying chores a pleasant task. Four copying methods are available to us. We have discussed the first one–LOAD/SAVE. Most DCUs, whether commercial or public domain, use the second method: File Directed Copy. This is similar to, but easier to use than the LOAD/SAVE method. After LOADing and RUNning the DCU, the program will ask you to put the source disk in the drive. Then it will ask which program or programs you wish to copy. You should have a list of the program names (directory) on the source disk handy, to refer to. Now you enter the file names to be copied and the program does the rest. Programs are read into the computer, and then you are asked to insert the destination disk. Then the files are written (recorded) onto the destination diskette. The method is neat and fast. You may copy programs from different source disks, if you like, onto the back-up disk.

Methods three and four are Whole Disk Copiers. They will copy the entire source disk to the destination disk, thus making a mirror image of the source disk. File names are not asked for. The DCU will begin reading the source disk into the memory. When the memory is filled up, you are asked to switch disks. The contents of memory are then written to the destination disk.

This sequence continues until both disks have the same data written on them. It is like filling a horse trough from the well. You just keep putting buckets of water into the trough until it is filled up.

The two Whole Disk Copiers accomplish the same thing, but use different methods. The BAM copier will copy only the tracks and sectors that have data in them. The Total disk copier will faithfully copy every track and sector, whether it finds data in them or not. Obviously, the BAM copier will be faster, but will not copy the elaborate "copy protection" codes written on some of the commercial program disks. The Total copier might be able to copy these disks, and might not. Copyright laws are useful and should not be abused. You should only copy commercial software for your own personal back-up, not for distribution to friends.

VIC COPIER

I use a commercial DCU for most of my library maintenance. The DCU is the Directed File kind and was written by Ray Schriener. Ray's copier is called the 1540/1541 Disk Back-up. This DCU will only work on the VIC. I have used it for half a year without failure. The copier will work with one or two disk drives. Two other utilities are provided on the disk. One is an automatic disk formatter. The other is a Directory Lister. The Lister will print the directory and each file's starting address (in hex and decimal) on the printer. The Copy program will copy Program, Sequential, User and Machine Language files. The instruction sheet that accompanies the disk assumes you already are a DOS wizard. One hint I will pass on to you is keep the Schreiner disk in the drive until the prompt "Filename?" appears on the

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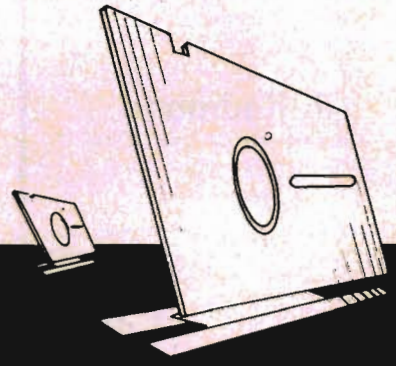

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by
Michael G Peltier

The 1541 Single Drive, Floppy Disk Maintenance Manual is just what the amateur or experienced electronics technician needs to keep his VIC-1541 in tip-top operating order. With the information furnished, almost any operating defect can be cured. The manual contains two foldouts and over 70 illustrations, including: Block Diagrams, Schematics, Waveforms, Interconnect Diagrams, Isometric Views and Test Point Locators.
Contents of the manual:
Section 1 Introduction
Section 2 Theory of Operation
Section 3 Initial Configuration
Section 4 Performance Test
Section 5 Calibration
Section 6 Disassembly/Reassembly
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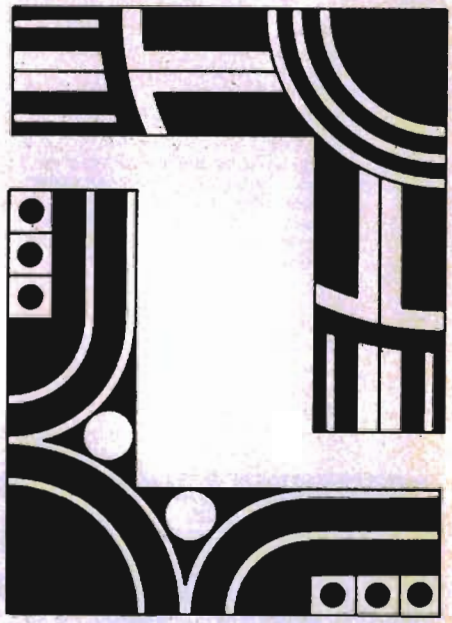
screen. Then insert the source disk. The 1540/1541 Disk Back-up is available from R. Schreiner, 391 Broadway, Bayonne, NJ 07002. $20 on disk only.

C-64 COPIER

After using my Commodore computer with a 1541 disk drive for two years, I have accumulated a stack of "bad" diskettes. I kept the disks because I hoped that someday I would learn enough about the DOS to be able to repair the blown directories and BAMs. I still cannot do it on my own, but with the help of a new DCU from Abacus, my chances have improved. The Super Disk Utility-64 (SDU-64) is a multifunction DOS aid. It has four different copier utilities. It has the second, third and fourth of the copier types mentioned above plus an "appended" copy routine. This lets you add the contents of an entire source disk to an existing destination disk. It is a cross between Whole Disk and File Directed copiers.

In addition to the four copy utilities, SDU-64 will display the Block Availability Map (BAM) on the screen. It also displays the directory and allows scrolling in both directions. The feature that first got my attention is the "Dump/Modify a Block" routine. You can load any sector on the screen and then change the contents using the full screen editor. When the sector has been repaired–or changed–it is written back to the disk

You don't have to be a DOS hacker to use the program. The 13 page instruction book is well written, and Abacus will replace a damaged SDU-64 disk for $5. Available from Abacus Software, Box 7211, Grand Rapids, MI, 49510. $22.95 on disk only.



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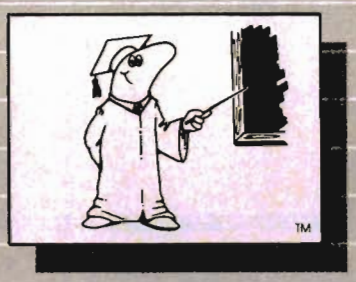

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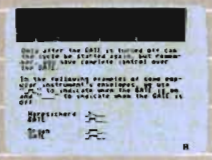

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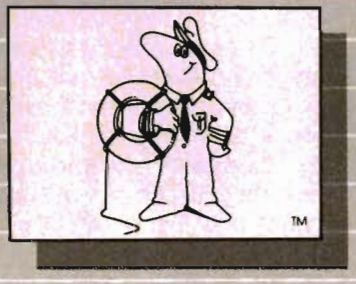

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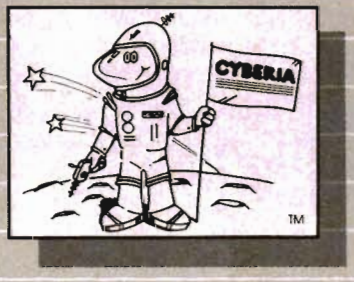

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COMMAND POST

By Jim Grubbs

I get a little crazy in winter. Some would say that my craziness is only a matter of degree, but I definitely think winter brings out my best. If it has been a hard winter, usually about the first week of March I get in my car, put in a tape of the Beach Boys surf songs, turn the heater on full blast, open the windows and cruise around town like it's the middle of summer. This is not only crazy, but can be nearly fatal in Illinois. If the winter is mild, the results may be even more dramatic. I still do the same things, but I may also insist on going on a picnic in the snow, or visiting the St. Louis Zoo at 20 degrees with a brisk northerly wind blowing. Fortunately, my computers and this column have a calming effect on me and with their help I soon return to my normal level of abnormality.

All of this is just my way of saying, if you feel snow bound, you're broke and everyone is screaming there's nothing to do, this month's column is just what you need. With a little luck, we will do something new and different, with no hardware to buy and only a simple program to type in.

By now, most all of us are familiar with communicating over the phone lines with our VICs or C-64s. Things like Compuserve and local BBS services can become addicting. As amateur radio operators we enjoy a similar form of over-the-air communication known as radio teletype.

WAITING FOR BAUDOT

If we go back in time, Morse code was one of the first forms of digital data communications. Next came machines that would mechanically send Morse code and print it on a typewriter device at the other end. It didn't work very well! Some diehards stuck with it, though, and by the time World War II hit, teletypewriter machines became a mainstay of communications. In the early days, most of them were hooked together using land lines where electrical current was keyed on and off in order to operate selector magnets that picked out the proper letter or number to print on the paper. The code used is called Murray or Baudot code. In modern terms, it is a five level code, with one start bit and one stop bit.

Some enterprising radio men suggested that this same system should work nicely over the airwaves, substituting on and off keying of the transmitter for the current keying in the phone lines. The system sounded like very strange high speed Morse code (generally 60 words per minute or, for you modernists, 45.45 baud). It worked moderately well, but was very prone to interference, particularly from things like lightning crashes.

Others began experimenting with a frequency shift keying technique. With it the transmitter frequency of the sending station is shifted between two values (originally about 850 hertz apart). Therefore, at all times there is a "carrier" present, which helps to quiet the receiving equipment. The two tones are called mark and space. Thus was born the method still in use today for transmission of data both over the air and, using the audio frequency equivalent (audio frequency shift keying), over voice-type telephone lines.

ASKING FOR ASCII

Modern day equipment like your VIC-20 and C-64 have their communications roots in this technology. The methods have improved and expanded, and today most of us use ASCII code which is generally an eight level code allowing for a larger number of different characters to be transmitted. Some systems include "parity bits" (another subject for another time) to insure more reliable transmission and reception. With Baudot and its five levels, only 32 different combinations of data can be sent. If we use a little trick and make one of those 32 combinations a "shift" command and one more an "unshift" command, we can sneak in the 26 letters of the alphabet, the numbers, and a few carefully selected punctuation marks.

As it comes, your computer, and most others, speak ASCII or a modified form of it. The Commodore folks have been kind enough to give us all kinds of control over our RS-232 port. We can control the speed (baud rate), the number of parity bits, stop and start bits, and, yes, even the number of data bits. After a little studying we find out we can fool the machine into speaking a foreign language–that is, Baudot!

Let's take a look at table 1. It is a binary representation of what the alphabet, numbers and other characters look like in Baudot code. If you look at a punched paper tape made on a Baudot machine the characters will be represented by holes punched in the tape where you see ones

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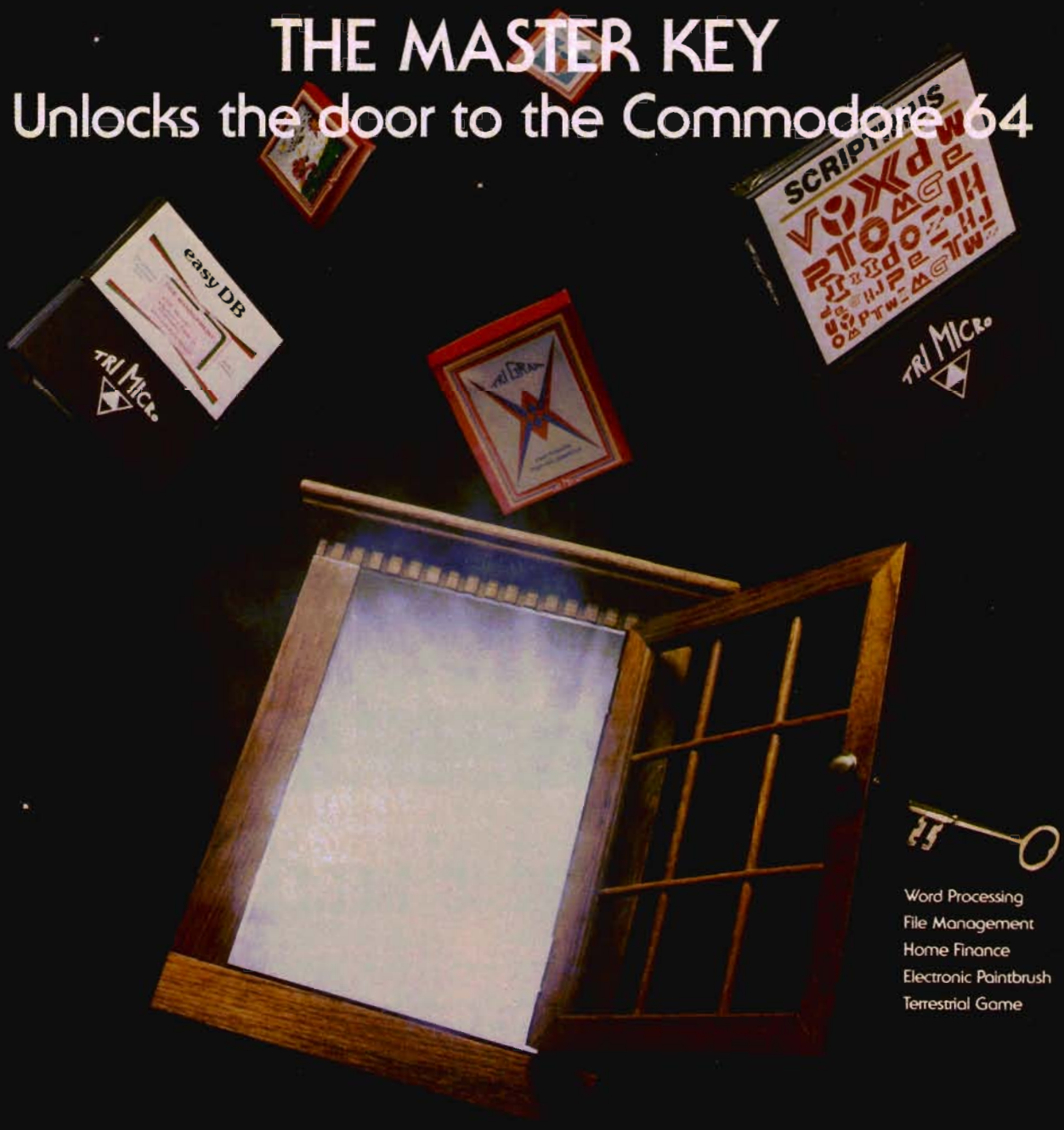

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in the table. Table 2 is a partial representation of ASCII code. Notice that for each combination of ones and zeros in our Baudot table, we can find a corresponding entry in our ASCII table if we ignore the three most significant bits (MSB).

Remember I said we could tell our computer how many data bits to expect? Let's do it (on paper) and see what happens. The programmer's reference guide has an extensive discussion of the RS-232 port. We can't duplicate it here, but suffice it to say that if we open an RS-232 channel with the following command, we have set up the channel just as we would for data communications using ASCII, but we have told the VIC or C-64 to pay attention only to the first five data bits received. Looking at line 200, the necessary BASIC statement is: OPEN 2,2,0,CHR$(96+1)+CHR $(0). If we now send Baudot code at the proper speed, the good ol' computer religously translates the incoming signal into what appears to be total nonsense. Not so, my friend! Look at the E in the Baudot table. If we look up the same five bits in the ASCII table we get an A, so that is what the computer prints. What happens here is that the computer is still speaking ASCII. We need to go to the U.N. for a translator!

HENRY KISSINGER, MEET VIC FROM ASCII LAND

If we go through the values on the charts, we can create a "translation" table to convert Baudot to ASCII. Basically we say to the computer, "Look, humor me, you and I both know this guy is sending you nonsense, but just for fun, everytime he sends you an A, print an E. Everytime he sends a Q, print a Z and so on. VIC, and its big sister the C-64, think we are really dumb, but go along and do what we tell them to. The result is plain English, just like our friend with the ancient Baudot machine sent us! Though we will save this for another time, we can use the same technique to convert our ASCII sending to Baudot–just go the opposite way when you create your translation table.

The next problem is one of speed. About the slowest anyone sends ASCII is 110 baud. Our "standard" Baudot speed is 45.45 baud and is not implemented on the VIC or C-64. Fortunately, some trail blazers have been this way before and found that any baud rate can be implemented on the VIC or C-64 with a couple of POKEs. The formula for 45.45 baud is:

POKE 665,236:POKE 666,87

Not all amateur communications takes place at 60 words per minute. Some use speeds up to 100 wpm. Many commercial stations use 67 wpm. A few lines of BASIC to the rescue and we can copy any of them. We accomplish this in our program in lines 300 through 350 and do the proper POKEs in line 20. A few other features are included. While the program is running you can return to the speed select menu by pressing the back arrow key in the upper left hand corner of the keyboard. Pressing the "L" key will force the program to print letters, and pressing the "F" key will force the program into figure mode. This is accomplished in lines 150 through 180.

Just for good measure we add unshift on space–to prevent the machine from staying in upper case and printing numbers when we are really receiving letters. This is abbreviated USOS and is user selectable. A USOS indicator is displayed on the screen when the option has been selected. You may wish to turn this feature off when trying to copy stations broadcasting such things as continuous groups of weather data. USOS is implemented in line 120. Like magic we have COMMAND POST RTTY (radio teletype).

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talk for a modem) to convert the tones coming from our receiver into levels the computer can deal with?

A ROSE BY ANY OTHER NAME

The interface published in the October Command Post can be used with a simple modification to copy RTTY. Copy should only be attempted on good strong signals with no interference or noise. It is necessary to use the user port connections (not the joystick) and connect the output of the interface to pins B and C, data in and handshake lines.

But I said we were going to do this for free, didn't I? Do you own a VIC Modem? A good many of us do. They are getting very inexpensive as modems go. A teletype terminal unit (interface) is really nothing in the world but radio talk for modem, which incidentally is a contraction of the words modulator (for transmit) and demodulator (for receive). The tones used for data transmission are different than those used for amateur work. There are two sets (see Table 3), one for the originating station and one for the answering station, so that you can operate full duplex, that is, two way communication. You will notice that the difference between the mark and space tones is 200 hertz. This is very close to the standard 170 hertz shift used in most amateur communications.

We can indeed use the modem to copy amateur teletype signals. All we have to do is get the audio from our receiver into the modem. The easiest way to do that is to come up with one of the modular cords used between the handset and the base of your telephone. I got mine from Radio Shack, though you should be able to find them at many discount stores as well as the phone center in your area. Cut the cord in half. You now have two, one as a spare or to share with a friend. There are four wires in the cord. They will probably be color coded red, green, black and yellow. For receive we want the red and green ones, or regardless of their color, the two wires on the outside of the cord. These wires are a bit hard to work with (very little wire and a lot of string!). I put an RCA phono plug on mine, but you can use anything. Run a cord from your speaker or headphone jack to the modified cord, plug it into the modem, plug the modem into the computer as you normally would. Make sure the computer is OFF when you do this. Load COMMAND POST RTTY, run it and you are in business. If you have never tuned teletype before, it is going to take some getting used to. Do not expect the carrier light on the side of the modem to flicker on and off with the signal. When

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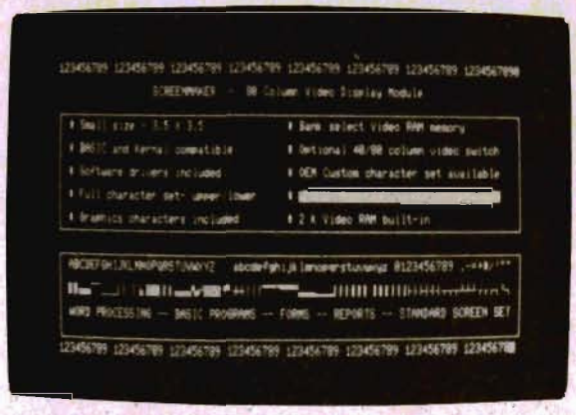

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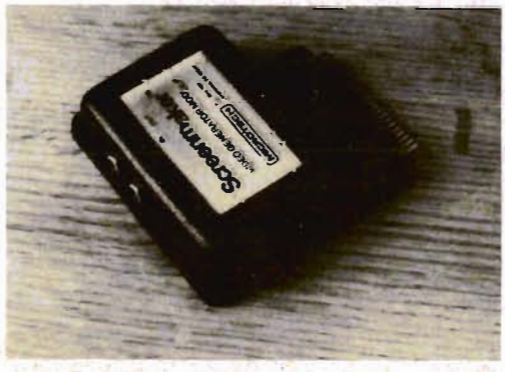

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properly tuned it will stay on all the time.

Find a good strong signal. Try to improve the signal to noise ratio by reducing the RF gain on the receiver and/or using a slow AGC action. The modem can be set in either the originate or answer mode. If you set it in the originate mode, you should tune until you are hearing approximately a two kilohertz tone, If you are in the answer mode, tune for around a one kilohertz tone. Teletype should start printing on your screen.

The VIC Modem doesn't make the best terminal unit in the world, but the price is certainly right. This is only the beginning. We're working on modifying it to provide the proper tones for transmitting RTTY as well!

EVEN CHEAPER

Do you copy the W1AW teletype bulletins and yearn to copy the ASCII bulletins that follow? The same technique will work here also, but of course you still need software. Commodore thoughtfully provided everything you need when you bought your modem. Load the VICTERM software, or any terminal program for that matter that has adjustable baud rate, RUN it and select the menu. Set the baud rate to 110 baud. No other modifications are necessary. Go into the terminal mode, and you are in business. Incidentally, the W1AA broadcasts are the only ones I can find on a regular basis. Occasionally some of you show up on ASCII. I'm sure as time goes by there will be more ASCII activity. You tune ASCII just like you do teletype. Try upper side band first, and tune carefully.

MSO... KEYMOUSE

While you are in search of some good strong signals to try the COMMAND POST RTTY program why not tune in on an MSO. These cryptic initials stand for Message Storage Operation. You might think of an MSO as the amateur radio equivalent of Compuserve's EMAIL! MSOs are another subject all by themselves, but they make great places to pick up a lot of information just by "listening in". Several that are quite audible in the Midwest are:

The K4CZ MSO in Lexington, KY on 7098.5 kilohertz,

The W5QXK MSO in Texas on 14087.75 kilohertz (daylight hours),

The WB4ZQB MSO Robbinsville, NC on 7087.8 kilohertz.

The first two are both 60 wpm standard RTTY (Baudot). The WB4ZQB MSO operates 110 baud ASCII on Wednesday, Saturday, and Sunday. The rest of the week it is also 60 wpm RTTY. You will find quite a bit of information about the VIC, 64 and various other pieces of hardware on these services.

ON THE AIR HELP

There are also several nets conducted on SSB (single side band-voice) that are of interest to Commodore computer users. The PET NET can be found at 1400 UTC (Universal Coordinated Time) (9:00 AM EST) on 7156 kilohertz on Saturday, and again on Sunday at 1800 UTC (12 noon CST) on 14240 kilohertz. Users of Kantronics software and hardware may find a net controlled by WB4HFQ of Louisville, Kentucky of interest. It meets Saturday and Sunday on 14316 kilohertz at 1430 UTC (9:30 AM EST).

If the QRM (interference) is too much and you are a Compuserve subscriber, why not try the Compuserve Ham Net with Scott Loftesness, W3VS as your system operator. Type GO HOM-11 at any Compuserve prompt.

If you have any additions to make to the MSO list or nets of interest to Commodore users, drop me a line to: Jim Grubbs, *COMMANDER* Magazine, P.O. Box 98827, Tacoma, WA 98498.

Table 1

This table is a representation of Baudot code. In the first column is the alphabetic character represented by the five-bit binary code that follows. The last column is what is printed when the receive station is in the "figures" or shifted mode.

E	00001	3
*	00010	–
A	00011	– (dash)
*	00100	(null)
S	00101	'
I	00110	8
U	00111	7
*	01000	carriage return
D	01001	$
R	01010	4
J	01011	'
N	01100	,
F	01101	!
C	01110	:
K	01111	(
T	10000	5
Z	10001	"
L	10010	)
W	10011	2
H	10100	#
Y	10101	6
P	10110	0
Q	10111	1
O	11000	9
B	11001	?
G	11010	&
*	11011	*(asterisk)
M	11100	.
X	11101	/
V	11110	;
*	11111	–

*line feed, space, carriage return, figures, letters (in that order)

Table 2

This table represents the alphabetic portion of the ASCII code.

A	00000001
B	00000010
C	00000011
D	00000100
E	00000101
F	00000110
G	00000111
H	00001000
I	00001001
J	00001010
K	00001011
L	00001100
M	00001101
N	00001110
O	00001111
P	00010000
Q	00010001
R	00010010
S	00010011
T	00010100
U	00010101
V	00010110
W	00010111
X	00011000
Y	00011001
Z	00011010

Table Three

Receive Frequencies in the "Answer Mode": MARK 1270 hertz SPACE 1070 hertz

Receive Frequencies in the "Originate Mode": MARK 2225 hertz SPACE 2025 hertz

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	Print Format	5 × 8 dot-matrix impact type
	Character Set	128 characters, with descenders (in ROM), plus 64 user definable characters (in RAM)
	Printing Speed	50 characters/sec
	Maximum Width	80 characters (equals 480 dots)
	Character Code	8-bit ASCII
	Printing Modes	Graphics, double width and/or double height character, standard character
	Multiple Copies	Original plus 2 copies
SPACING	Character Size	Standard 5 × 8 dots, Double width 10 × 8 dots, Double height 5 × 16 dots, Double width and height 10 × 16 dots
	Character Spacing	10 characters/inch
	Line Spacing	1/6, 1/9, N/18 ($0 \leqq N \leqq 255$) inches
	Linefeed Speed	5 lines/sec (6 lines/inch), 7.5 lines/sec (9 lines/inch)
PAPER	Paper Width	Adjustable up to 10 inches
	Paper Feed	Tractor feed
RIBBON		Single color, special self-inking cassette
POWER SUPPLY	available for either	117, 220, 240 VAC ± 10%, 50/60Hz
POWER CONSUMPTION		25 watts (printing regular characters) 9 watts (standby)
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Circle No. 208

COMMAND POST RTTY

```
10 GOTO 200

20 POKE 665,R:POKE 66
   6,Q

30 LS=-1

40 LF$=CHR$(10)

50 CR$=CHR$(13)

60 L$=''E''+LF$+''A[s
   p]SIU''+CR$+''DRJN
   FCKTZLWHYPWOBG*MXV
   *''

70 F$=''3''+LF$+''-[s
   p]'87''+CR$+''$4',
   !:(5')2#60197&*./:
   *''

80 GET#2,C$:IF C$='''' 
   THEN 150

90 C=ASC(C$):IF C<1 O
   R C>31THEN 80

100 IF LS THEN C$=MID$
   (L$,C,1)

110 IF NOT LS THEN C$=
   MID$(F$,C,1)

120 IF US$=''Y'' AND C
   $=''[sp]'' THEN LS
   =-1:REM USOS

130 IF C$<>''*''THEN P
   RINT C$;:GOTO160

140 LS=(C=31)

150 GET A$:IF A$='''' 
   THEN 80

160 IF A$=''L'' THEN L
   S=-1

170 IF A$=''+'' THEN C
   LOSE 2:GOTO 200

180 IF A$=''F''THEN LS
   =0

190 GOTO 80

200 OPEN 2,2,0,CHR$(96
   +1)+CHR$(0)

210 US$=''Y'':PRINT ''
   [clr][down, 2 time
   s]USOS[sp](Y/N)''

220 INPUT US$

230 BR=60:PRINT ''[clr
   ][down, 2 times]WH
   AT[sp]SPEED'':PRIN
   T ''(60,67,75,100[
   sp]WPM)''

240 INPUT BR

250 GOSUB 300

260 PRINT ''[clr]COMMA
   ND[sp]POST[sp]RTTY
   '':PRINT SPC(11) +
   STR$(BR)+''[sp]WPM
   ''

270 IF US$=''Y''THEN P
   RINT ''[home][down
   ]USOS[sp]ON''

280 PRINT

290 GOTO 20

300 D=1.023E6

310 IF BR=60 THEN B=45
   .45

320 IF BR=67 THEN B=50

330 IF BR=75 THEN B=56
   .92

340 IF BR=100 THEN B=7
   5

350 X=INT(D/B+.5):Q=IN
   T(X/256):R=256*(X/
   256-Q)

360 RETURN
```

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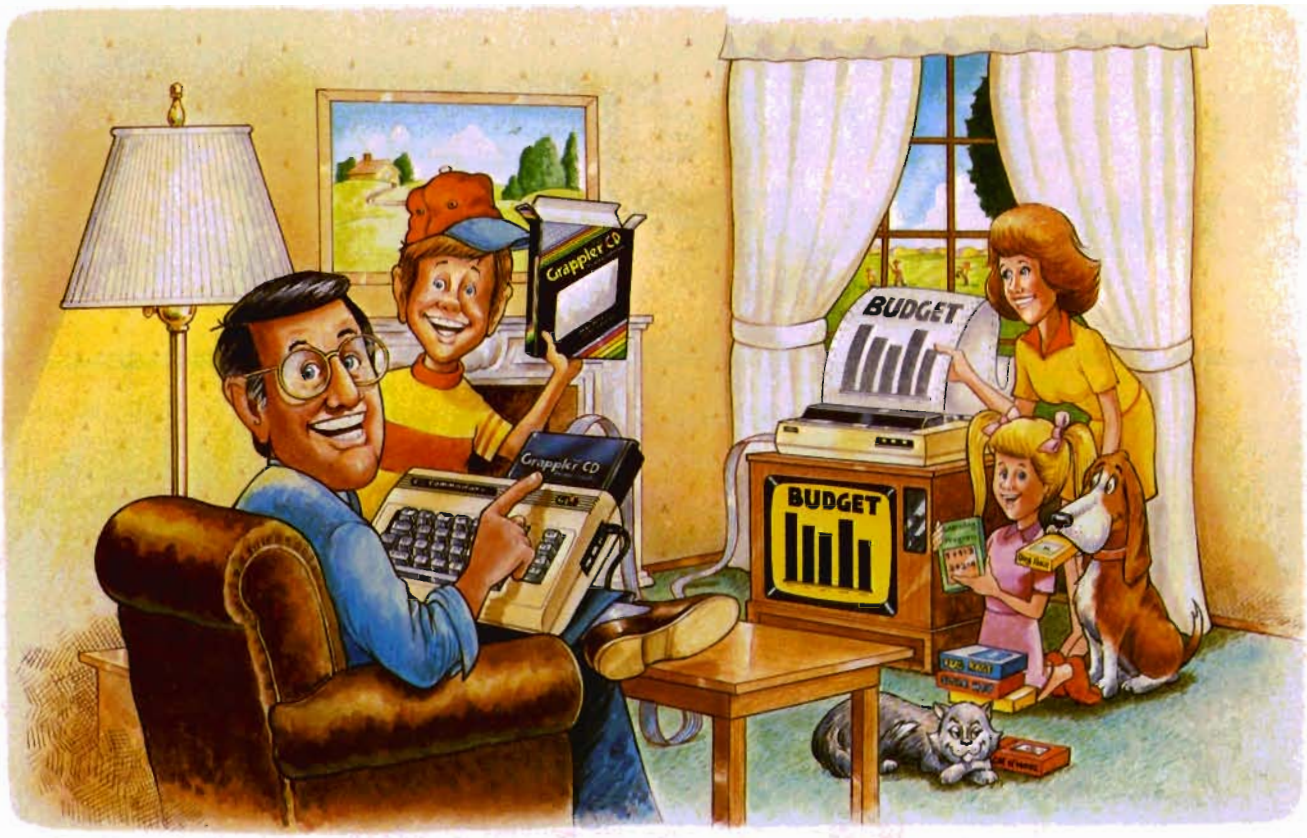

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Will IBM Make Peanuts of COMMODORE?

By Robert J. Tuffly

At the recent winter Comdex Show in Las Vegas, the name International Business Machines (IBM) was on the lips of many exhibitors as they roamed the massive Convention Center and expensive, elitist hotels. The main question was about the new IBM PCjr, or the "Peanut", as it has been coded in the industry. For the first time since its unveiling in November of 1983, people were actually allowed to handle IBM's newest creation, to look at some of its programs, and to ask a myriad of questions about compatibility, price, and software specifics. However, the questions that arose to other minds were its value. Rumor has it that the Texas Intruments' abrupt demise from the microcomputer field was due to early speculation over the PCjr. That same speculation may have contributed to the accelerated price drop of the Commodore 64.

Aside from IBM's prominent name, will the Jr. end up being just another gamble in this paradise of potluck or will it significantly change the market, as its rumors dictate? Moreover, will Commodore 64, currently the number one selling home computer on the market with expected sales of over one million machines between June of 1983 and June of 1984, be able to weather this digital storm?

According to Myr Jones, a spokesman for Commodore, CBM has a steady 40% of the home computer market. In this light, Commodore is obviously concerned over the legendary computer giant entering the low-end computer industry. When asked what Commodore expected from the new IBM product, Jones said "IBM is now putting a price stabilization umbrella over the marketplace." He then made a comparison: "Cadillacs and Chevrolets have always been able to live together. Commodore has no intention of becoming a Cadillac."

FEATURING SOME FEATURES

(NOTE: IBM has introduced two models of the PCjr: the ENTRY Model, which has a standard keyboard and 64K RAM System Unit, and the EXPANDED Model which has an additional 64K RAM in the System Unit along with other features. Unless otherwise specified, this article refers to the Entry Model.)

From the user's viewpoint, the keyboard of a computer is the most important physical feature. Comfort of the fingers and direct accessibility of functions make or break a system. While the C-64 has a raised full-stroke keyboard with 66 keys and 4 direct key functions, the PCjr has 62 keys and no direct function keys. Also, the C-64 has keyboard graphics clearly marked and accessible from each key. However, the PCjr is 83-key-scan-code compatible along with 10 function keys (1-0), if a series of keystrokes is performed by the user. With a keyboard overlay, these functions are readily addressable, but at an additional cost of $10 for five overlays.

For touch-typing convenience, the Commodore has a typewriter-style keyboard with the keys flush against each other, containing concave grooves for finger comfort. The PCjr has what is called a "rubber dome technology," which is a rubber textured key, says Jill Liscom, a spokesperson for IBM. Furthermore, the keys are flat and spaced apart for the overlay, portraying a calculator-style board. In fact, many observers have noted similarities between the Jr's board and the TRS-80 Color Computer board, which is often referred to as a "chiclet" keyboard.

One possible advantage that IBM has over the Commodore is the cordless keyboard. Running off infra-red signals, the keyboard can be used up to 20 feet from the display with no physical connection. Writers can literally step back from their work on the PCjr. If you do wish to be more attached to your System Unit (the control module where most of the features are contained), a cord which interfaces the two costs an additional $20.

In terms of cursor control, IBM has a slight advantage, in my opinion. Commodore requires that you use the shift key along with the respective cursor keys for opposite directions. With the PCjr, there are four keys, one key for each cursor direction.

DISK DRIVE & DISPLAY

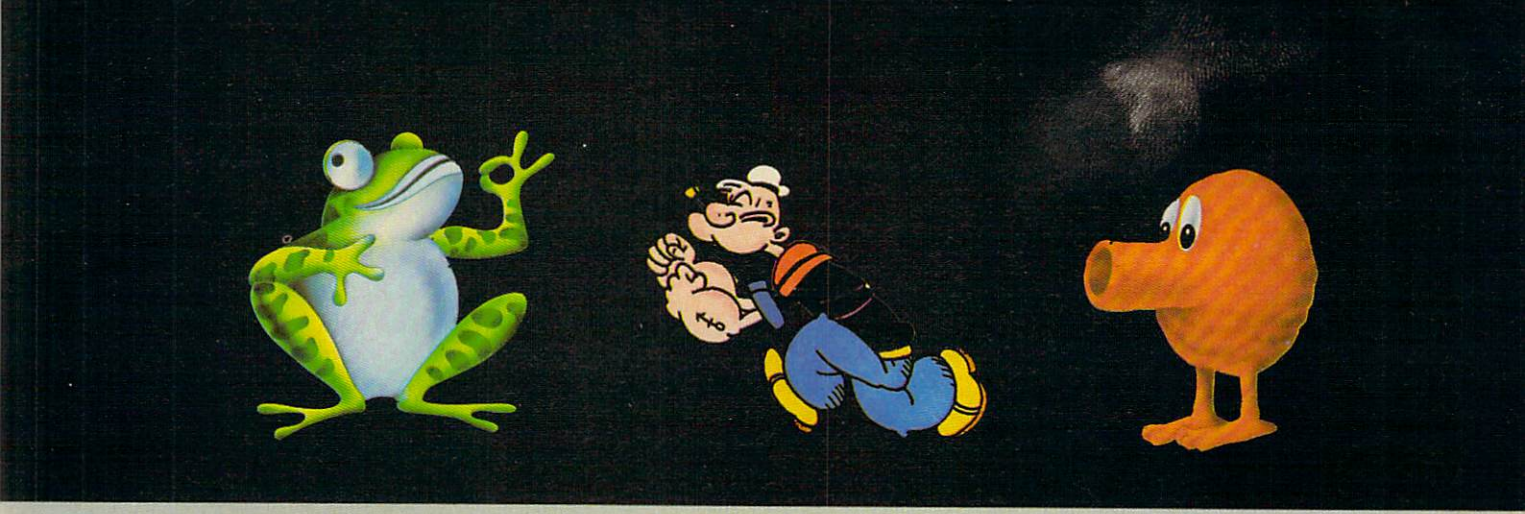
When comparing disk drives, the main point to remember is: How much power do you really need in comparison to how much time you want to spend? Although the Commodore disk drive is slow, the 1541 drive does contain its own operating system, and thus requires no memory from the computer's own RAM. It can store 170K bytes of data on each disk.

On the other hand, the PCjr's disk drive uses a 5-1/4" floppy, double-density, double-sided disk which stores 360K bytes of data. It is supported by DOS 2.1 system which is also used in the IBM personal Computer (PC)–its "Daddy" so-to-speak. In this sense, IBM has achieved a reasonable degree of compatibility. However, the disk drive causes the computer to lose 24K RAM while it is in use.

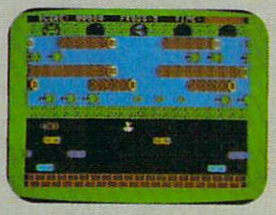
As a side note, did you know that the C-64 can run up to five disk drives at a time while the PCjr can run only one? In essence, if you were to link two drives to your Commodore system, you could have about the same data capabilities as the IBM but not at the same speed.

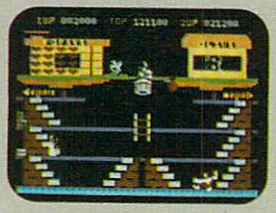
SOUND AND GRAPHICS

Sound capability is what first helped to sell the Commodore 64 back in early 1983, comments Jones. And sound is what has made games for the Commo-



GIVE YOUR COMMODORE 64™ A LITTLE CHARACTER.





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dore computer some of the most amusing and realistic available. There are few home computers that can even come close to the C-64 in this respect. With three voices at four wave forms each and nine octaves per voice, the C-64 enjoys this sound advantage–even today.

The PCjr's sound chip, though adequate, does not measure up to the C-64's. The PCjr has three channels of sound plus a noise channel, with 16 attenuated levels (individual volume control) and seven octaves each. Commodore has three programmable filters for each voice and a master volume control. The PCjr has only one low pass filter and no master volume.

When it comes to video resolution, the IBM has an edge. But, if you want to do more with a chip than look at it, then Commodore holds its own. When the versatile C-64 sound is coupled with its sophisticated sprite graphics, the user or programmer has a powerful gaming system. The 16 colors make the C-64 a very versatile machine. The background and foreground can be individually programmed along with the sprites, which can be different colors too.

The PCjr has 16 colors as well, but it does not possess the built-in sprites as Commodore does. With the IBM, however, you can individually program the pixels for high resolution. A Commodore spokesman says that the Commodore graphics are almost as good as the PCjr's. Moreover, the PCjr has an overall higher resolution, giving sharper color on all fields with eight graphic modes in the Expanded Model. As with the C-64, the PCjr can change background and foreground colors through software control.

COMPATIBILITY SOFTWARE, & EXPANSION

Unfortunately, Commodore has not made its various machines fully compatible. There are some aspects of the C-64 and the PET that can be re-programmed to become compatible, via a PET Emulator, but for practical purposes, compatibility is minimal for the average user.

It's a different story with the PCjr. Care was taken to make this machine largely compatible with the Personal Computer and the Personal Computer XT. One aspect is the DOS 2.1 system. This will presumably allow compatibility for the majority of programs written by IBM for these computers, if the memory requirements are within the PCjr's limits.

Judging from the type of software being produced, IBM has apparently geared the PCjr toward business and education. Commodore seems to have a leading edge in the recreation area, and enjoys increasing software support for serious applications as well. When asked to which machine IBM will be focusing most of their software attention, Liscom says that IBM does not usually speculate the future plans of the company.

However, MicroSoft, a major business and educational software company, is licensing programs for both IBM and Commodore. One such program that runs on both machines is MultiPlan, a sophisticated spreadsheet program. With the PCjr, additional memory expansion is needed for storage, while with the C-64, MultiPlan can be run as is. Says Rod Bauer, Public Relations General Manager for Microsoft, "We think that the PCjr is a very considerable marketplace . . . . about 50% of our software is written for the MS DOS (which is in the PC). If possible, and with some consideration, we plan to convert (software) for the PCjr."

When asked what kind of person might buy the Jr., Bauer replied "The person who wants the security of a large company name . . . . and the person who wants more educational work from his computer."

The C-64's memory is not expandable, but there have been very few cases in which expandability is required in a 64K system. Many of the best data bases, word processing programs, and games can run on the C-64 with no difficulty at all. In this sense, contentment has reached a large and growing audience.

The PCjr, however, is expandable. In the true IBM tradition and with enough money, the PCjr can be expanded to 128K RAM and an 80 column display. (80 column is also available for the C-64 with cer-

Continued on page 126

TECHNICAL SPECIFICS

COMMODORE 64	IBM PCjr
6510 microchip	8088 microchip
8 bit	pseudo 16 bit
64K RAM	64K RAM
20K ROM	64K ROM
unexpandable	128K RAM expandable
1 cartridge port	2 cartridge ports
cassette port	cassette interface
2 joysticks	2 joysticks
light pen	light pen
modem capable	internal modem capable
3 month warranty	12 month warranty
serial bus	RS232-C serial port
----------	I/O expansion bus
TV capable	TV capable
not compatible (w/other computers)	PC & XT partial compatible
Parallel Printer capable	Parallel Printer capable

GRAPHICS

COMMODORE 64	IBM PCjr
40 column (80 column exp.)	40 column (80 column exp.)
16 color	16 color
Programmable foreground	Programmable foreground
& background	& background
Sprites (21 x 24 pixels each)	----------
320 x 200 pixel w/16 colors	*320 x 200 pixel w/16 colors
----------	*640 x 200 pixel w/4 colors

*Memory Expansion required

**PRICE

COMMODORE 64	IBM PCjr
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Tape	$69.00	$56.00	$37.00
Disk	$79.95	$63.00	$42.00
Total Text 2.6 Word Processor			
Tape	$44.95	$39.00	$26.00
Disk	$49.00	$42.00	$29.00
Total Label 2.6			
Tape	$24.95	$18.00	$12.00
Disk	$29.95	$23.00	$15.00
Programmers Helper (Disk)	$59.00	$39.00	$29.95
Basic Tutor (Tape/Disk)	$29.95	$24.95	$15.00
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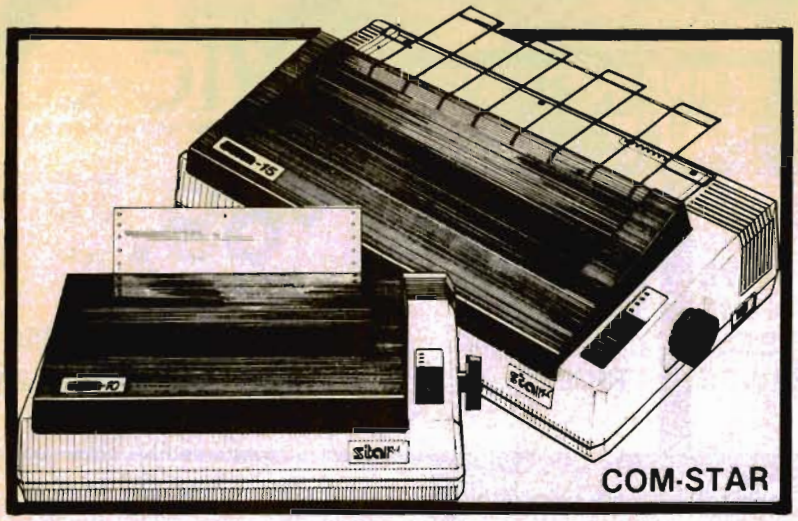

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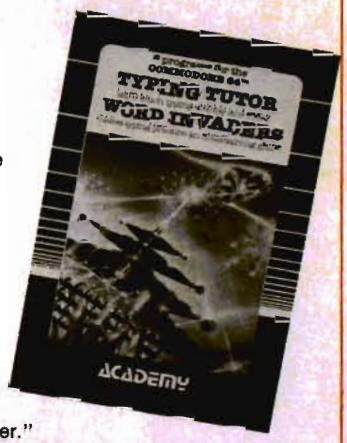

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Introduction to Assembly Language Programming
Part XIV: RTS But No BRK

By Eric Giguere

This article marks the end of a first, long cycle, and foreshadows the start of a second. Throughout my series I've discussed nearly every possible aspect of assembly language. Last month in our discussion of wedges, we got into some programming that even went beyond what I consider a basic tutorial on assembly language. This month is to be the last installment in my introductory tutorial series, but not, as you'll see later, my last article on assembly language. First, we'll briefly go over the concepts we've learned in the 14 months my series has been running, and then try to see how it all relates.

SERIES OVERVIEW

I think we have accomplished quite a bit in this series. The first article, the introduction, appeared in *COMMANDER'S* premiere issue–December 1982. Since then my series has appeared in every issue of *COMMANDER,* much to my pride. We took a look at the basic differences between assembly language and machine language, about the tools used in programming either, and about the hexadecimal and binary systems. I then introduced you to registers, branches, comparisons, math operations, logical operations and much more. We have progressed from the novice to the intermediate, or at least experienced beginner level–all without (I hope) frustration. To aid you along the way I presented my EDIT/ASM (editor/assembler) program (June, August and September 1983 issues of *COMMANDER)* and the tutorial "How to Use a Monitor", which included the monitor program BASICMON. *COMMANDER* has definitely gone a long way in helping its readers learn about one of the more obscure aspects of Commodore computers.

APPLYING WHAT YOU HAVE LEARNED

With a solid background in assembly language, either through my series or some other sources, you should now be able to write your own assembly language routines. Granted, you may not be able to create your own word processor or spreadsheet, but you should be able to write small routines for inclusion with programs in BASIC. Most importantly, you'll be able to understand the assembly language routines published in *COMMANDER.* This will enable you to learn even more, since a lot of good techniques can be found by examining other programs. In short, you've become "computer literate" on the machine's own level. BASIC seems puny by comparison.

When writing assembly language programs it is always best to have decided what you want from the program. Be exact–don't just say it should do maybe this and perhaps that. Say that it *must* do this. That way you can plan the form your program will take. It also helps to have a good programming tool–namely, an editor/assembler. Making minor changes in BASIC is fairly easy, but in assembly language it can be a real pain without the proper tools.

Part of good planning involves choosing the right memory location for your program. Will it interfere with BASIC? How about cassette operation? Graphics? Other assembly language programs? Depending upon the application, some or all of these may cause problems. (For example, look at all the programs created to run in the block of memory at $C000 on the C-64. Trying to get two of these to run at the same time requires extensive reprogramming.) Good planning also involves reserving memory locations for program variables. Here again the above problems may apply. If your program is to work with BASIC it doesn't do any good to use the BASIC pointers as storage locations. Neither is it any good to plunk a variable in the middle of another assembly language program. In short, planning an assembly language program can be a much more complicated affair than planning a BASIC program.

When writing a program you should also look at the algorithms (programming routines) that you will use. Are you going to use a lot of subroutines? Commonly-used subroutines are often found in magazines and books. It's useful to keep a library of these for easy inclusion in your own programs. You should also question whether it's even worth attempting to program your intended application if someone else has already done it. After all, why re-invent the wheel? You might make some changes to a program to suit your specific needs but at least you don't have to program it yourself. This is just a general rule, of course. Many people, myself included, like to program simply for the fun of it. We may be doing something useful at the same time, but we're mainly exercising our minds. As one of my readers recently put it: ". . . part of the attraction of writing your own programs is the pleasure of finally seeing them work after all the frustration of creating them." What else can I say?

DEBUGGING THE PROGRAM

Entering your program into memory isn't enough. Now you have to examine it with a keen eye for any problems or "bugs." You have to wipe those critters clean off the face of the earth (or at least out of your program). This means testing

your program for anything that can go wrong. Once you find a bug you fix it and test it once more. Just make sure you have a backup copy saved on disk or tape in case one of those bugs gets loose and crashes the machine.

When debugging a program look at it through the eye of an inexperienced user with two left thumbs. Make all the blunders you can think of and see how your program handles them. After all, you may know exactly what the program can and cannot do, but this doesn't mean that everyone else does. Good error trapping with comprehensible messages (there is nothing more perplexing to inexperienced users than seeing something like "?REDO" after entering what they thought was a correct value) makes a program much easier to use. It may mean more work for you but the end user is sure to appreciate and respect you for it.

WHAT THEN?

After you have created and debugged a program you have several choices as to what to do with it. You can give it away to friends, user groups, etc., as a public domain program. Another choice lies in submitting it to a magazine such as *COMMANDER*. If it is published, not only will you get recognition as an author in a national publication ("Just who is this Giguere guy and where in the heck is Peace River?") but you'll get paid for your hard work. Of course, if your program is really excellent you might also consider publishing it through a reputable software firm for even more recognition and money. Very few programs ever make this category but perhaps yours will.

BACKUPS

You've probably heard this before but I think it deserves repeating: always keep backup (extra) copies of your programs somewhere safe and sound. Otherwise all your work could go down the drain with a small accident. Believe me, this happened to me on several occasions and it was no picnic trying to recreate what I had lost! And when making your backups, make sure you include some documentation with the program, whether in the source code listing or in the program's filename. Then when you go through your programs one year (or may one week?) later you'll know what each program does. You'll never know how helpful this is until you desperately need a program that has been stored under some obscure name such as "PROGRAM #3" or "TEST4". A computer may have instant recall but your human brain sure as the heck doesn't!

Continued on page 126

Commodore 64

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Submitted materials should follow these guidelines;

1. Articles must be typed double-spaced, in upper and lower case on 8½″ × 11″ paper, with at least 1½″ margins on all sides. Good quality printers may be used if the output is clear and dark. Two copies of each article should be included.
2. Programs must be provided in both hard-copy listing and machine-readable form (tape or disk). Where feasible, please include both C-64 and VIC-20 versions. If not accepted for publication, materials can be returned only if a SASE is enclosed.
3. On each page should appear your name, the title of the article, the date submitted, and the page number. Any accompanying listings, photos, graphs, etc., must be clearly identified.
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Double Vision

GETTING THE MOST OUT OF YOUR "80-COLUMN" VIC-20 OR C-64 (USING A VIDEO DISPLAY EXPANDER)

By Colin F. Thompson

The following letter from *COMMANDER* reader Mr. George Rivera in Yonkers, New York raises two points concerning the Data 20 eighty column card. (also sold by Protecto, Apropos, and other distributors). Mr. Rivera's questions about compatibility and custom characters are valid and oft asked. I hope my reply will be helpful to all.

Re: Customizing characters on the VIC-20 with the Data 20 Cartridge.

Dear Colin:

I've enjoyed reading your column "Double Vision" for the last three months because it is very informative.

I have a VIC-20 with a cassette tape, VIC 1525 printer, Amdek green monitor and a few cartridges. I also have a Data 20 40/80 column Display Manager with 8K of extra memory. I can't wait for your next review of programs that will and will not work with the Data 20 card. I've written some small programs for my own household needs as well as some games, but there is a problem. I hope you can help me out.

I know that the VIC stores its characters in ROM beginning at location 32768. By changing the pointer from ROM to RAM, the character set may be rewritten for any need.

My question is "How can this be done with the Data 20 cartridge on?" Can you help me? I'm sure there are a lot of VIC-20 owners out there with the same problem.

Dear George:

Your questions are reasonable and certainly deserve a reply.

Point One–"Which programs work and which don't?"

The VIC is composed of eight blocks of memory. Each block is 8K. Yes, the VIC is really a 64K computer, with some of the RAM missing when you buy it. The Data 20 card, when plugged in, occupies an entire block of memory–8K–beginning at $A000. This is the infamous Block 5. It is the block where most game cartridges operate from, so you can see that the Data 20 and game cartridges won't work together. That's OK, because the games usually redefine the VIC's character set into a set of hi-res graphic symbols which Data 20 can't display anyway (more on that later).

As you can see, there is one hard and fast rule in operation here:

Block 5 Programs Won't Work

Block 5 is a favorite hiding place for games and utilities. It is out of the BASIC program storage areas, but can be used in much the same way as the cassette buffer–a place to put machine language programs. The VIC does not come equipped with memory plugged into Block 5, so some RAM must be added if you wish to use the block. This is quite simply done. Cardco's Cardram 16 will provide 8K of RAM in Block 5 with only the flip of a switch. But remember, as soon as you put some RAM or ROM (game cartridges) into Block 5, the DATA 20 card will not work–and will prevent the other program from working as well. Two programs will not work in the same memory block at once.

That leads us to the big question: Which programs occupy Block 5? In the overall scheme of things, not many programs live in Block 5. However, many utility cartridges do live there. As far as I can determine, all of the Programmer's Aid (PA) cartridges live there. One of the best word processors for the VIC–Wordcraft 20–lives there. Even so, that is not a big problem. Wordcraft 20 is a 22 column program. It simply won't expand to use all 80 columns. The PA's will only work with 22 columns because they don't need 80 columns.

Word processors and spreadsheets are the kinds of programs that really benefit from the expanded screen. (Databases, label makers and terminal programs work well at 40 columns, but that is beside the point). The point is, the 80 column display is designed for "business" applications. Our versatile VIC is capable of many functions, but most don't really *require* an 80 column display. I'm sure you have already discovered that most commercial VIC software and many public domain programs are formatted on the screen for 22 columns. The programs usually work well, but the screen is a mess. Reformatting to 80 columns can be a fun and educational experience, as long as the original program was written in BASIC.

An inexpensive way to learn how to do this is to get a $10 tape from Public Domain, Inc. There are about 75 programs on each tape, and most are written in BASIC for the 22 column screen. I've converted many of the better PDI programs to

40 or 80 columns and had a lot of fun doing it.

So far, we've seen that some programs don't work, and most will work but the screen looks weird. The obvious question now is "What works well?" Good news. If you use your VIC or 64 for word processing or business work, many of the top flight programs work perfectly. A few were even written specifically for the 80 column display. Data 20 provides (free) a useful word processor and merge-label program with each card sold. Word Manager has a full screen editor and displays all 80 columns at once. It is very easy to learn. I use it a lot for 1-2 page business letters.

Their much-advertised 80 column spreadsheet program is now being shipped also. I have been using it for a few weeks now. It's very fast and displays 7 columns of 11 characters as default values. Plan Manager approaches PractiCalc in complexity and power. I plan to review this gem later this spring.

Any review of useful 80 column VIC software would not be complete without mentioning Quick Brown Fox. I've been using QBF for more than a year to write articles and letters. When I expanded to 80 columns, the program took a giant leap in usefulness. Now I can view my document on the screen and know *exactly* how it will look on the printed page. Until your word processor is blessed with an 80 column screen, a lot of paper and ink will be wasted trying to see how the formatting will look. Believe me, I found out the hard way.

TOTL Label and TOTL Text (in their latest revision) work fine. Another really good piece of software I've found for my 80 column VIC/64 is Flex File. This database manager is completely compatible, although I usually use it with only 40 columns on the screen.

I hope this answers your first question, so let's move on to the graphics problem.

Point Two –"Why do custom graphic characters fail to show on the screen?"

As you can see, the characters printed on the 80 column screen are not the same as the VIC normally provides. The Data 20 character set is a clear, crisp professional looking typeface that looks like it was lifted directly from a DEC minicomputer. The key to understanding why custom characters can't be displayed lies in how those gorgeous letters get on the screen.

Simply stated, the Data 20 card does not use the VIC's ROM (or re-directed RAM) character set. It can't. It must use it's own custom generated characters. They come from a big 24 pin character generator ROM chip plugged into the Data 20's PC card.

Stated another way, the Display Manager shortcuts the VIC's operating system. When you press a key on the VIC, the Data 20 card grabs the character before it can reach the Screen RAM area of the VIC. The kidnapped character is then routed into the Data 20 card and matched up with a list of screen codes. When the match is made, the VIC generated character is discarded and its Data 20 duplicate is sent to the screen. So, for example, a "giant" 22 column VIC "G" gets turned into a much smaller Data 20 "G". Since the Screen RAM in the VIC is never used to generate a picture, you can see why your custom character sets fail to materialize. For the same reason, any game that redefines the VIC character set will also fail to work.

Is there hope for 80 column games? Probably not. Due to severe workspace limitations inside the Data 20 operating system, the entire screen cannot be bit-mapped, so there goes any hope of making a hi-res game for it.

George (and other interested readers), I hope this answers your questions. The Data 20 device was simply not designed to operate with games. It's prime purpose is to enhance the VIC's and the 64's word processing abilities. Of course it does many other things, but in my jaundiced view, a word processor with less than 80 columns doesn't deserve the title.

Regards, Colin

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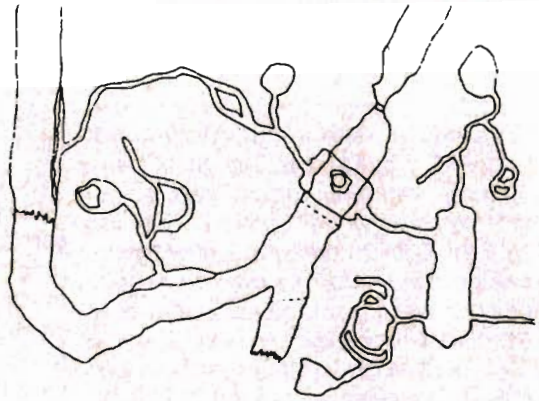

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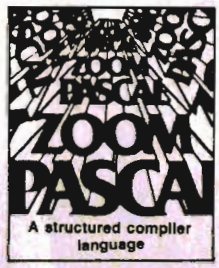

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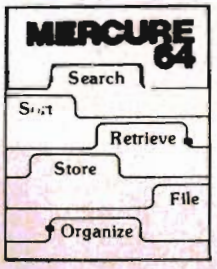

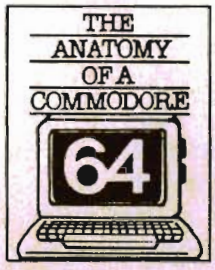

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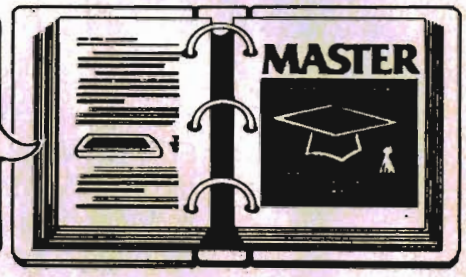

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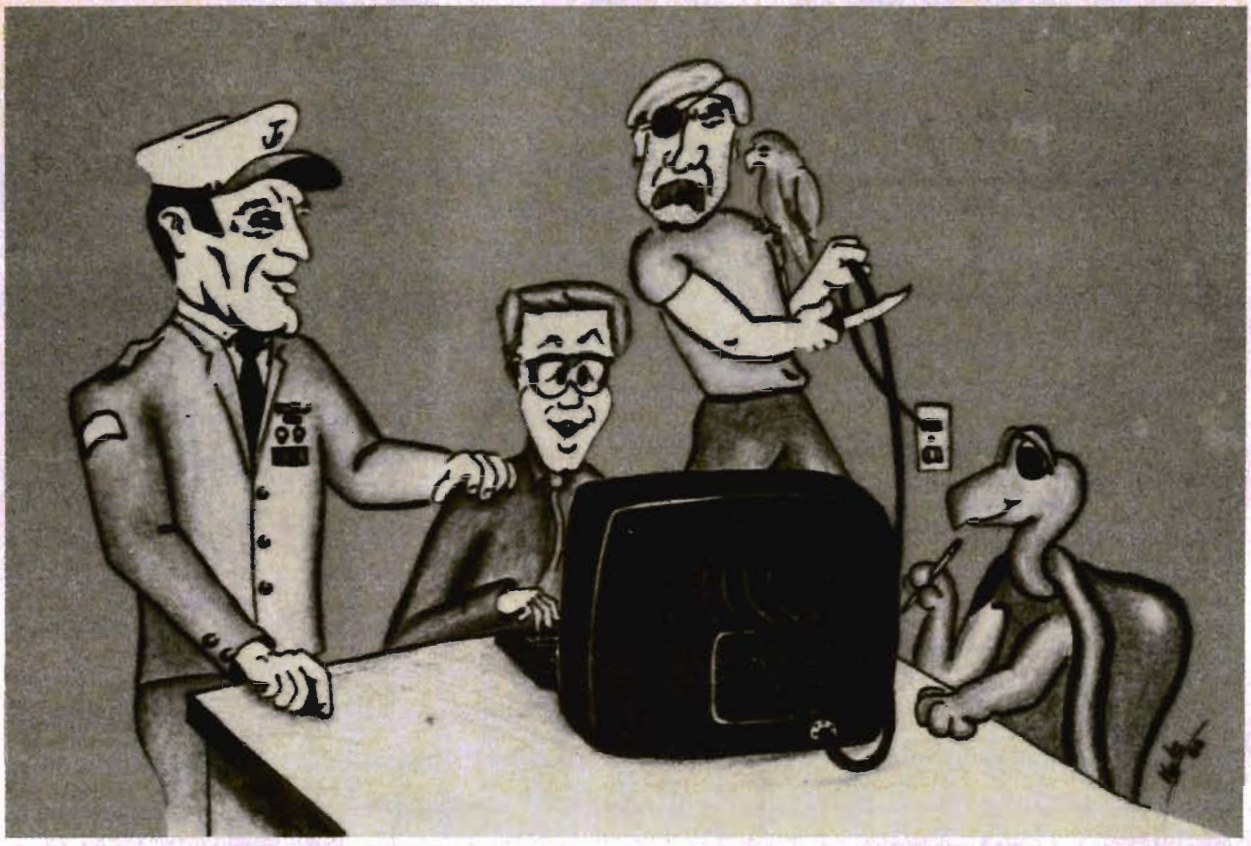

Illustration: Courtesy of Tamarack Software.

The contest will end March 15, 1984. Entries must be mailed to *COMMANDER,* Your Program in Pilot Contest, PO Box 98827, Tacoma, WA 98498. Your program must be on diskette or cassette, and include a copy of your sales receipt or invoice. All entries will become property of Tamarack Software, Inc., and will be nonreturnable unless accompanied by a self-addressed mailer with sufficient postage attached.

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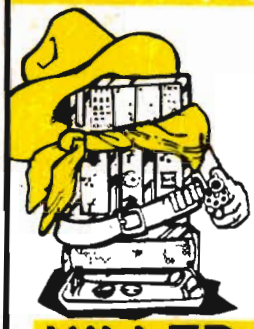

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Circle No. 25

Electronic Blackboard
REVIEWS of EDUCATIONAL SOFTWARE

By Maryanne Dodd

Often when we think of using the computer as a tool for education our minds zero in on one particular type of software. It may be our favorite approach of teaching a subject or it may simply be the last program that we examined. By using this kind of logic we ignore the fact that educational software has many facets. In fact, as the state of the art improves we can look forward to more innovative software using a broad range of concepts suitable for a wide age span.

This month I am reviewing three very different games and a utility program designed especially for teachers. All three of the games would be equally appropriate for either classroom or home computers.

SPELLBOUND by Felipe Carvajal from TIMEWORKS is a spelling game that takes the Spelling Bee into a fast-paced stinging activity. The game combines a word search format and nontraditional Spelling Bee in a game that is both fun and educational.

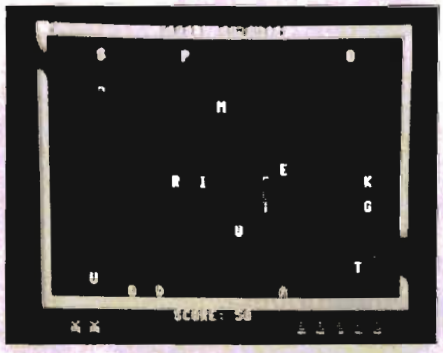
DUNGEON OF THE ALGEBRA DRAGONS, also from TIMEWORKS, is an adventure game that requires players to solve quadratic equations or dip into their treasured gold reserves when they are encountered by the Algebra Dragon.

IN THE CHIPS by Gene Genoar at CREATIVE SOFTWARE is an economic simulation that is reminiscent of the familiar board games but it goes a step farther in really creating conditions and variables that would be impossible without a computer.

Last, there is GRADECALC from TAMARACK SOFTWARE, a gradebook and classroom management program that will make the old spiral bound gradebook obsolete while saving valuable classroom time. The teacher will be able to effectively and efficiently keep and manipulate data, and have available printouts that require little time and effort.

TITLE: SPELLBOUND

FORMAT: Diskette/Cassette.
MODEL: Commodore 64.
AUDIENCE: Age seven and up.
SUMMARY: Fast paced word seach spelling game.
SOURCE: TIMEWORKS, INC.
P.O. Box 321
Deerfield, IL 60015
(312) 291-9200



For some students, mastering the weekly spelling list is a boring, dreaded chore that is often accomplished under considerable duress. Well, help is nigh. SPELLBOUND by Felipe Carvajal from TIMEWORKS is an innovative game that combines rote memory spelling practice with fast paced game action.

Each game of SPELLBOUND consists of twenty lessons. Each lesson contains a word that is to be spelled. The word is placed on the top of the frame that borders the computer screen. Inside the screen the letters of the word are randomly placed along with decoy letters. Using a joystick the player must guide the "spelling bee" and "sting" the letters in the correct sequence. After all of the letters are touched, "YOU DID IT" flashes at the top of the screen and the next lesson begins.

If the player stings an incorrect letter the Bee explodes and the lesson starts over. Also as the Bee moves across the screen he leaves a trail; if he backtracks or crosses over his trail he explodes and the lesson starts over. At the beginning of each game there are four Bees. For each explosion a Bee is lost. The number of bees remaining is displayed at the bottom of the screen. When a player runs out of Bees the game is over. Also displayed at the bottom of the screen are five beehives. Whenever a player gets into an impossible situation–that is, he or she cannot access the remaining letters or is about to recross his path–he may push the fire button and restart the lesson without losing any of his bees. Each escape costs one beehive. There is no penalty if all of the beehives are used. There are ten levels of difficulty in the game. As the levels increase, more decoy letters are placed on the screen and the Bee moves faster.

SCORING

Fifty points are awarded for each correct letter. If the entire word is completed the lesson number is multiplied by twenty-five and the resulting product is added to the score. Intermittently during the game a beehive is displayed on the screen. If the player stings a beehive, he or she is awarded a fifty point bonus and the game will slow down for a little while allowing the player to score more letters at an easier level. The game score and the previous

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high score is displayed at the end of each game.

SOUND AND GRAPHICS

There are no superfluous graphics to distract from spelling during the game. The letters are displayed on a black screen with a blue border and the bees and beehives are the only other objects on the screen. The sounds are those one would expect to find on a typical computer arcade game. While the player is guiding the Bee a lilting melody is heard. The tempo of the melody becomes faster as the levels of difficulty increase. When a correct letter is touched a "ping" sound is heard. And of course when the bee explodes there is the "computer explosion" sound.

WORD OPTIONS

There are three preprogrammed lists of words in the SPELLBOUND program. There is also the option of compiling your own lists of words for games and saving them to a separate tape or diskette. Each list can contain up to twenty words from three to twenty-five letters in length. Since the lists are saved on separate tapes or diskettes there is no limit to the number of customized lists that can be created.

DOCUMENTATION

The documentation accompanying SPELLBOUND consists of a booklet that gives explicit directions for playing the game and compiling your own word lists. The whole approach of the booklet concentrates on user friendliness with clear, concise instructions.

EDUCATIONAL VALUE

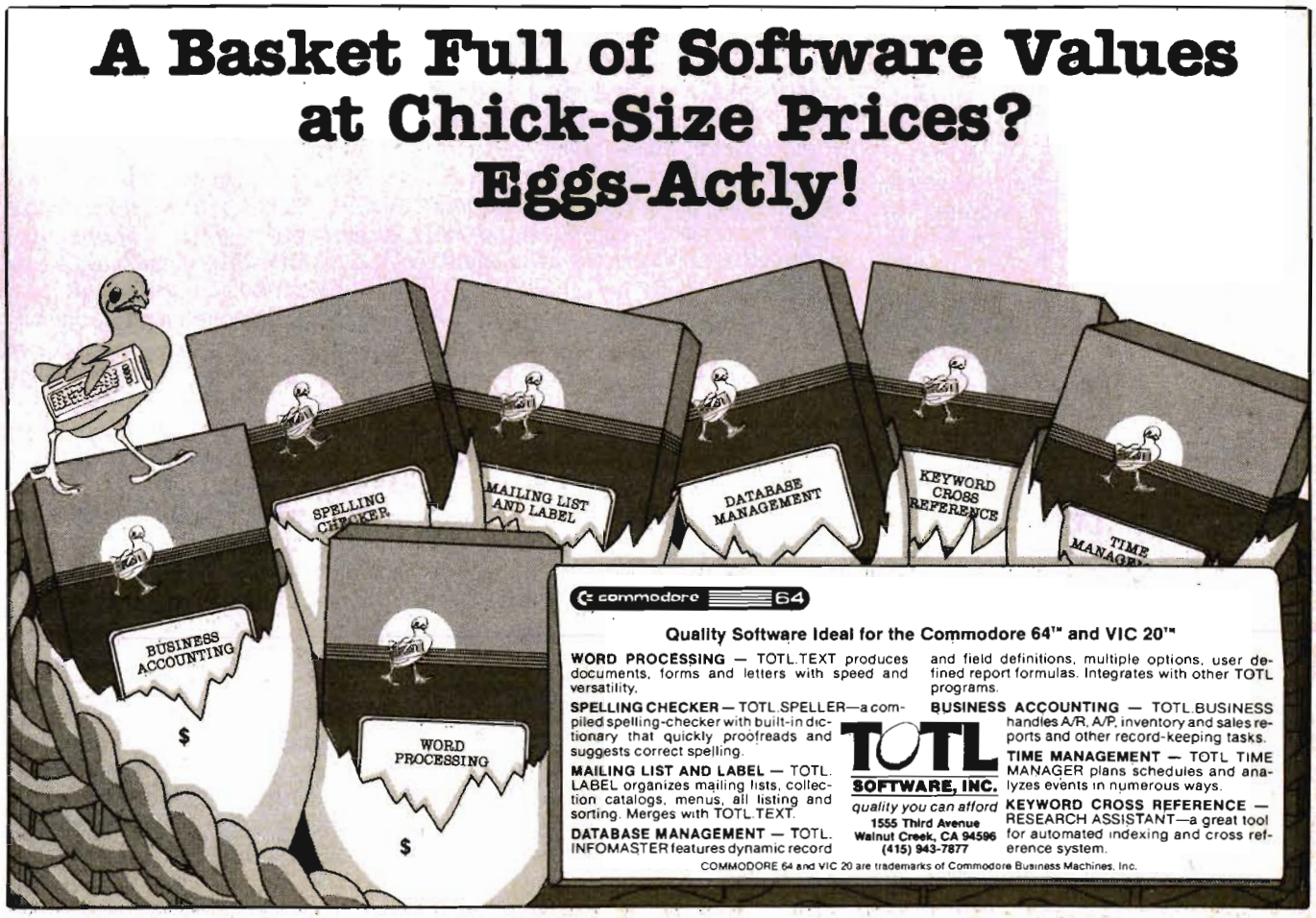
SPELLBOUND provides a challenging medium for practicing spelling words. When the word is flashed on the screen the player has five seconds to look at the word and plan his appropriate strategy before "Spelling Bee" starts moving. After the five seconds, because of the fast action required, the player will not have time to glance at the word. He or she will be forced to act quickly while automatically visualizing the word. The action is fast enough that even the best "arcade experts" will find a challenge at the higher levels.

I liked SPELLBOUND and feel that it has definite merit. It takes a task that is often dull and boring and turns it into a fast paced action game. The program would be useful either in the classroom or at home. With the ability to design your own word lists, individualized lists could be generated for any number of subjects or levels.

My only word of caution is that the game does take a certain amount of dexterity and fine motor coordination. A child lacking in these skills or one that is not able to operate a joystick effectively might find the game frustrating if he or she is able to spell the word correctly but cannot maneuver the Bee properly or efficiently enough to obtain a high score.

TITLE: DUNGEON OF THE ALGEBRA DRAGONS

FORMAT:	Diskette/Cassette
MODEL:	C-64
AUDIENCE:	Jr. High School or First Year Algebra Students.
SUMMARY:	A strategy adventure game featuring drill of quadratic equations.
SOURCE:	TIMEWORKS, INC. P.O. Box 321 Deerfield, IL 60015 (312) 291-9200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DUNGEON OF THE ALGEBRA DRAGONS is a strategy adventure game from TIMEWORKS. The scenario involves being locked in the dungeon of the algebra dragon. To obtain freedom you must search for the two magic keys and the exit while avoiding the perils of the dungeon. The dungeon consists of three levels with twenty rooms in each level. Each room has three exits to other rooms. The rooms may or may not have perils or helpers.

HUNGRY DRAGON

At the time you are cast in the dungeon you have in your possession 1,000 pieces of gold. Each time the algebra dragon is encountered he presents an equation. If you are able to answer the equation correctly, gold is added to your reserve and the dragon evaporates. If you fail to answer correctly, the correct answer is given and you lose gold coins. If you fail to answer correctly and do not have gold coins to feed the hungry dragon "YOU BECOME THE DRAGON'S DELIGHT" and the game automatically ends.

DANGER BEWARE . . . . .

To make your journey more challenging, in addition to the algebra dragon there are other perils to be encountered as you tour the dungeon. Before any of the perils are met you will be forewarned. If you feel a draft you should be aware that there is a trapdoor in one of the adjoining rooms. The sighting of spider webs alerts you to the presence of a spider. Be prepared to stomp the spider because three spider bites are fatal. Also lurking about the dungeon are playful ghosts. If you enter a room inhabited by a ghost you will be automatically transported to another room that may have perils of its own.

So that not all of your efforts will be to no avail, there are some helps scattered throughout the dungeon. If you enter a room with a bag of gold you may pick it up and add it to your reserves. Also ladders are placed in various rooms allowing you to move to the different levels in your search for the magic keys.

FREEDOM OBTAINED

If you are successful in your quest by obtaining the magic keys and finding the exit to escape the dungeon, "CONGRATULATIONS! YOU HAVE ESCAPED THE DRAGON'S MENU" appears on the screen. You are also given a score consisting of the time it took you to escape and the number of gold pieces that you have left.

LEVELS OF DIFFICULTY

There are four levels of difficulty in the DUNGEON OF THE ALGEBRA DRAGON. Level one has easier equations and fewer perils while levels two and three have increasingly more difficult equations and more perils. As an interesting twist in level four, the player is allowed to choose the level of difficulty of the equations and the number of dragons and perils. The computer randomly creates a different dungeon and changes the location of the keys, dragons, ladders and perils unless the player chooses to replay a previous dungeon.

SOUND AND GRAPHICS

The graphics used for the game are good. Each room has a receding three dimensional effect with pertinent information displayed on the back wall and ceiling. To exit a room, the player–using either the keyboard or a joystick–propels a little man into the door and he is transported into the next room. During any period of action there is music with varying tempos and the expected bells and whistles when dangers are encountered.

DOCUMENTATION

Accompanying the program is a booklet that clearly presents the options and rules for the game. Instructions are very well written in a manner suitable for the intended user. Also included in the booklet are some strategies and suggestions for playing the game.

EDUCATIONAL VALUE

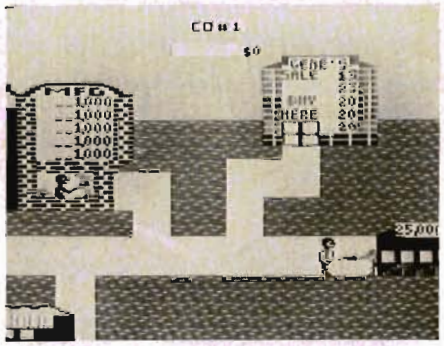
DUNGEON OF THE ALGEBRA DRAGONS provides drill in the solving of quadratic equations. It is not a teaching program. There is the assumption that the player has some familiarity with equations and basically knows how to go about solving them. The game would be useful to a student who needs drill type practice for reinforcement and mastery of quadratic equations.

Also, as in all strategy games, logical thinking is required if the player desires to play the game efficiently and escape in the shortest amount of time. To avoid confusion most players will be required to devise a map and develop a system for exploring the rooms and the various levels.

While preparing the review I showed the game to some teenage friends and asked their opinion. The general consensus, given the choice of practicing equations using a book for drill or this computer game, was that everyone chose the game. Also it was brought to my attention that the plot for DUNGEON OF THE ALGEBRA DRAGONS is very similar to ROBBERS OF THE LOST TOMB (also by TIMEWORKS). The people who had played both games felt that the dragon and equations added to the game and found DUNGEON OF THE ALGEBRA DRAGONS to be preferred and the more challenging of the two.

TITLE: IN THE CHIPS

FORMAT: Cartridge
PRICE/MODEL:
VIC-20 $29.95
Commodore 64 $34.95
AUDIENCE: Fourth grade and up.
SUMMARY: A simulation game involving the economic theories behind the establishment and marketing strategies of a fictional business in Silicon Valley.
SOURCE: CREATIVE SOFTWARE
230 East Caribbean Drive
Sunnyvale, CA 94089
(408) 745-1655



Frequently economic theories are hard to teach because students have a hard time visualizing abstract concepts and variables and have no way of testing the principles. Computer simulations can be a means of creating a situation and allowing students to test and apply the knowledge that they have attained from books or other sources.

CHIPS by Gene Genoar from CREATIVE SOFTWARE is a simulation involving the establishment and operation of a business in Silicon valley. The game may be played with the computer or another person as a competitor. The opponents decide at the start of the game the number of quarters, from one to twenty, that their business will stay in operation and whether or not monopolies will be allowed. At the beginning of the game each person has $100,000 cash to invest in a company. The money may be invested in research and development, manufacturing, and/or advertising.

As in real life, before you can market a product there must be research and development. The players are given a choice of five products: ZURH, PIPES, CHIPS, ASTRO, or XATAR. They may choose to develop just one or all the products at any time. Naturally, research and development costs are high. Five thousand dollars is charged for each product developed. After the player has established a line of products the next step is manufacturing. The manufacturing cost is $10 for each

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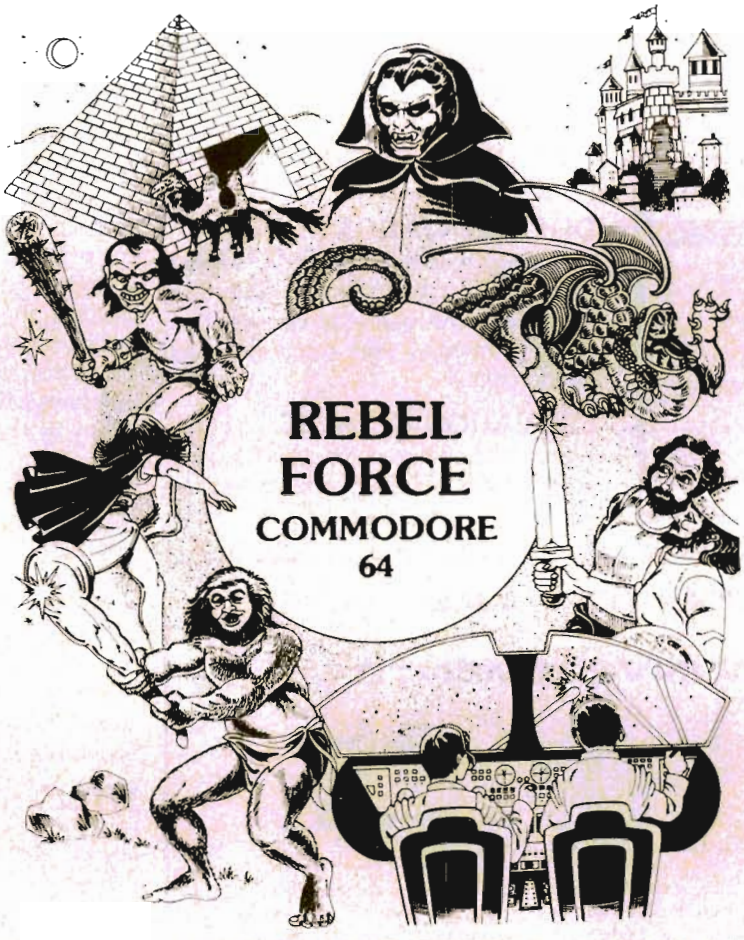

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SOUND AND GRAPHICS

The graphics are very cleverly done. Each player controls the president of one company by means of the joystick. Research and development, the brokerage, and advertising are all located in separate buildings along the street. The animation and number of changes during the game greatly add to the understanding of the economic theories. The twangy and staccato sounds fit in perfectly with the graphics.

DOCUMENTATION

The documentation consists of a folder accompanying the cartridge. Directions for playing the game as well as some simple strategies and suggestions are given in detail.

EDUCATIONAL VALUE

Even though the conditions in the game are greatly simplified when compared to a real business, there are still a number of economic principles which the student can understand better by playing the game. As in most simulations there are some random variables which the players have no control over. For instance the computer decides the amount of public demand and will occasionally escalate the demand for one product or completely bottom out the demand for another product. The individual players must deal with inventory control, pricing and advertising. By watching the warehouse graphs, the players will learn the value of manufacturing enough product to meet public demand but not overproducing and having cash resources tied up in unsold inventory. Marketing skills will be sharpened by price setting and advertising. To show a total net profit, players have to learn how to set prices high enough to recover manufacturing costs and make a profit, yet low enough to be competitive. Players will also learn the value of balancing their advertising costs with their other expenses. Even if a student has a monopoly on a particular product, the computer does not tabulate sales unless the player has created public awareness through advertising.

Players will create their own levels of difficulty by the sophistication of their strategy. Younger, inexperienced players may not be able to develop complicated strategies controlling all variables, but they will enjoy the game while learning the economic theories. More mature players might tend to be aggressive in their approaches and pay attention to subtle effects of changing variables. They will learn to consistently watch economic trends while gaining a better understanding of economic principles.

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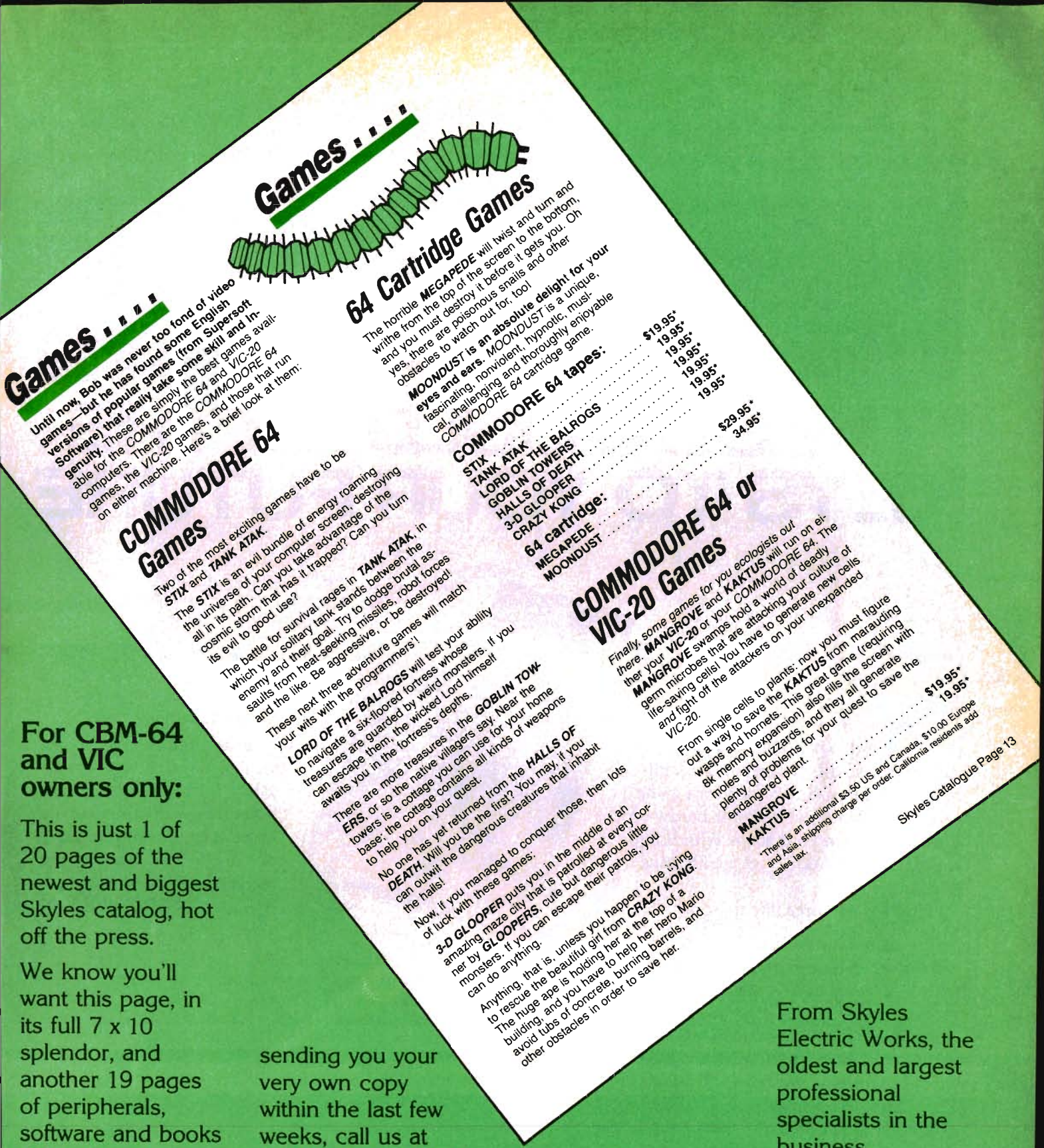
TITLE: GRADECALC

FORMAT: Diskette
PRICE: $29.95
MODEL: Commodore 64
AUDIENCE: Teachers
SUMMARY: Classroom record and grade management program system.
SOURCE: TAMARACK SOFTWARE
Darby, MT 59829

I must admit that when I received an examination copy of GRADECALC my enthusiasm was less than overwhelming. Grade book management, in my opinion, is one of those facets of education that I consider a necessary evil. Granted, records must be kept and evaluations must be made, but I prefer to do them in the simplest possible way that involves the least amount of time and energy.

So, half-heartedly, I started looking at the manual accompanying GRADECALC, and then I became more excited. TAMARACK has come up with a program that has some interesting possibilities.

Continued on page 89


Games . . . .
Until now, Bob was never too fond of video games—but he has found some English versions of popular games (from Supersoft Software) that really take some skill and ingenuity. These are simply the best games available for the COMMODORE 64 and VIC-20 computers. There are the COMMODORE 64 games, the VIC-20 games, and those that run on either machine. Here's a brief look at them.
COMMODORE 64 Games
Two of the most exciting games have to be STIX and TANK ATAK.
The STIX is an evil bundle of energy roaming the universe of your computer screen, destroying all in its path. Can you take advantage of the cosmic storm that has it trapped? Can you turn its evil to good use?
The battle for survival rages in TANK ATAK, in which your solitary tank stands between the enemy and their goal. Try to dodge brutal assaults from heat-seeking missiles, robot forces and the like. Be aggressive, or be destroyed!
These next three adventure games will match your wits with the programmers'!
LORD OF THE BALROGS will test your ability to navigate a six-floored fortress whose treasures are guarded by weird monsters. If you can escape them, the wicked Lord himself awaits you in the fortress's depths.
There are more treasures in the GOBLIN TOWERS, or so the native villagers say. Near the base, the cottage you can use for your home to help you on your quest.
No one has yet returned from the HALLS OF DEATH. Will you be the first? You may, if you can outwit the dangerous creatures that inhabit the halls!
Now, if you managed to conquer those, then lots of luck with these games:
3-D GLOOPER puts you in the middle of an amazing maze city that is patrolled at every corner by GLOOPERS, cute but dangerous little monsters. If you can escape their patrols, you can do anything.
Anything, that is, unless you happen to be trying to rescue the beautiful girl from CRAZY KONG. The huge ape is holding her at the top of a building, and you have to help her hero Mario avoid tubs of concrete, burning barrels, and other obstacles in order to save her.
64 Cartridge Games
The horrible MEGAPEDE will twist and turn and writhe from the top of the screen to the bottom, and you must destroy it before it gets you. Oh yes, there are poisonous snails and other obstacles to watch out for, too!
MOONDUST is an absolute delight for your eyes and ears. MOONDUST is a unique, fascinating, nonviolent, hypnotic, musical, challenging and thoroughly enjoyable COMMODORE 64 cartridge game.
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CRAZY KONG 19.95*
64 cartridge:
MEGAPEDE $29.95*
MOONDUST 34.95*
COMMODORE 64 or VIC-20 Games
Finally, some games for you ecologists out there. MANGROVE and KAKTUS will run on either your VIC-20 or your COMMODORE 64. The MANGROVE swamps hold a world of deadly germ microbes that are attacking your culture of life-saving cells! You have to generate new cells and fight off the attackers on your unexpanded VIC-20.
From single cells to plants: now you must figure out a way to save the KAKTUS from marauding wasps and hornets. This great game (requiring 8k memory expansion) also fills the screen with moles and buzzards, and they all generate plenty of problems for your quest to save the endangered plant.
MANGROVE $19.95*
KAKTUS 19.95*
*There is an additional $3.50 US and Canada, $10.00 Europe and Asia, shipping charge per order. California residents add sales tax.
Skyles Catalogue Page 13

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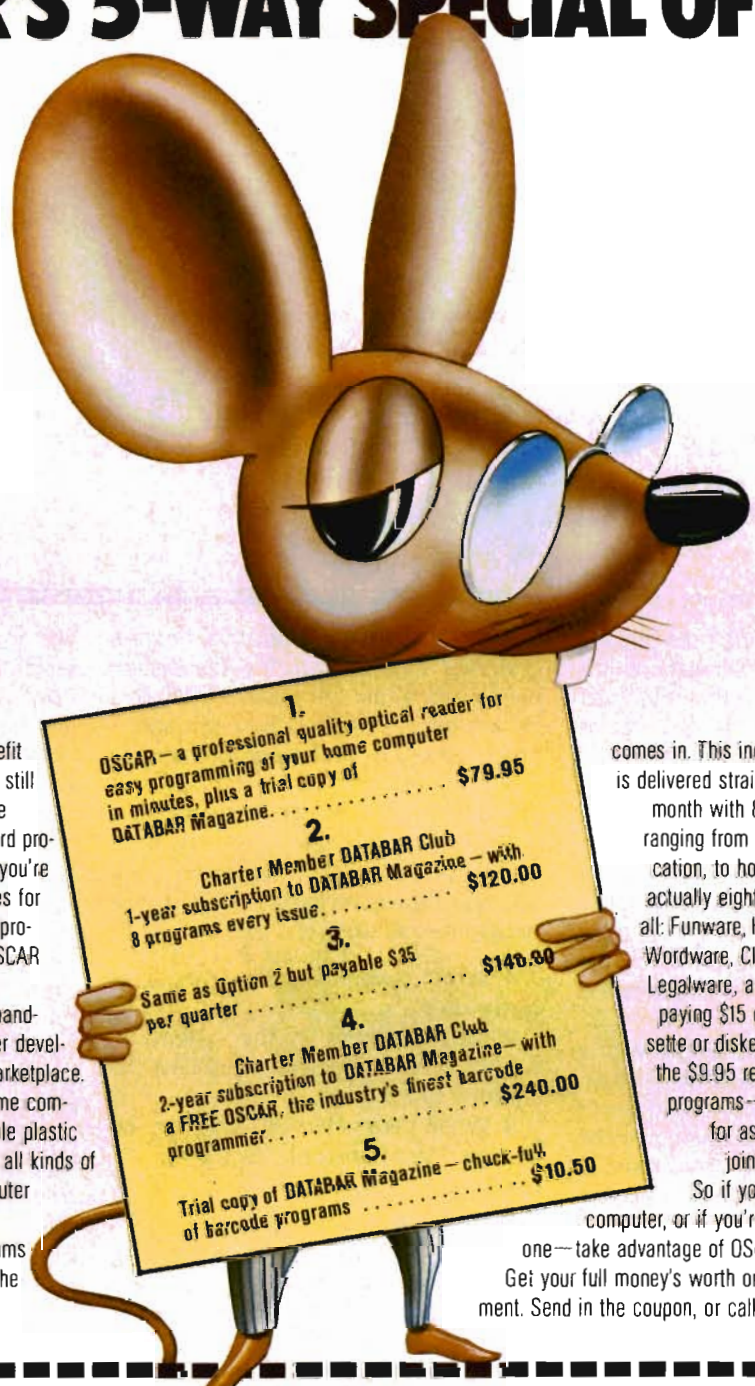
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BASIC Education: Programming for Learning
Part III-SIMULATIONS

By Andy Van Duyne

One of the most exciting uses of computers in education lies in simulations. In a simulation, students have their own laboratories where they can change variables at will, indulge in fanciful speculation, and visit worlds and situations they might not otherwise be able to experience. Using a simulation as their vehicle, students can visit the inside of the sun, the nucleus of an atom, or blow up the world. No matter what, nobody gets hurt. In the meantime, they have been able to observe the interaction of several variables and develop concepts of systems.

A simulation presents the user with a framework or set of boundaries within which he or she is free to move, and one or more parameters that can be changed by the user. For example, the famous "Lemonade" program, which exists in several forms for several computers, requires the user to balance the costs of ingredients, advertising, and other supplies with weather forecasts and location data. The object is to trim costs to achieve the maximum profit over a period of time. The program "Oregon Trail" confronts the user with the choices that may have presented themselves to the pioneers as they travelled across the country.

A very practical use of simulations is in the science area. The student can explore systems that might otherwise be too costly or dangerous to replicate in the average school lab. (Experiments in atomic physics, for example, might be just a bit beyond most school system's facilities and budgets, but become practical when simulated.)

When designing a simulation, the programmer must first define the system within which the user will work. While a certain degree of randomness is sometimes amusing and appropriate (i.e., changing weather in "Lemonade"), a simulation has the most educational value when the user can rely on the system to behave predictably and accurately. Once you have developed the system, you must decide the following:

1. Which parameters are changeable by the user.
2. What changes in the system resulting from the user's entry will be reported to the user.
3. What parameters (if any) can be changed "spontaneously" by the computer.

The programs included here were inspired by my memories of engineering school, and hours spent in the electrical lab. Perhaps two-thirds of my precious lab (learning) time was tediously spent wiring up circuits to be tested, leaving the balance of the time to do actual measuring. Build the circuit, fire it up, measure it, take it apart, and make another one (after finding components of the desired value in cluttered parts trays and boxes). The programs here investigate the properties of series resistance in DC circuits. Using these simulations, a student can design, "build" and "test" dozens of circuits in the same span of time that would allow only one or two actual circuits to be built and measured. Use of the programs is rather straightforward–once LOADed, just RUN. The version for the C-64 takes a few seconds to move characters from ROM to RAM. Both programs use custom characters for the resistor "squiggles" and the ohm sign. These characters were loaded into the top of user memory on the VIC, and all text messages come out normal because they are printed in reverse. This, by the way, is a very handy way to conserve memory on the VIC while using your own character definitions. Chances are, in most cases, you will be defining only a few characters, and not the entire 64! It is best to redefine them from the top down, starting with character 63, and protect only that small top segment from BASIC intrusion with the appropriate POKEs to locations 51, 52, 55, and 56. (See VIC Reference guide.) While in the custom character mode, all text printed in reverse will appear as normal, unreversed text–therefore, you do not have to use all the precious space by redefining them. This trick, however, does not work on the C-64. With the acres of memory available in the 64, the frugality required by the VIC programming can be forgotten. In fact, while using your own characters in the 64, each character must be defined, including the alphabet. Also, because the schematic diagrams generated in these programs are comprised of the lines and corners graphics symbols, one must move the first 128 characters down from ROM into a usable RAM area. This takes a few seconds, as 1,024 bytes are involved! Don't panic when the title page appears, and nothing else seems to happen. You may notice that the keyboard is also "frozen"

during the transfer, so things like STOP/RESTORE will appear to have no effect. This situation is remedied after the characters are moved and the keyboard interrupt is turned back on.

Other than the character set-up, there is little difference between the C-64 and the VIC-20 versions. After the character set-up, the number of resistors to be in the circuit (1-3) is selected. The appropriate display strings are then selected, and the custom character mode is set. The main program loop is between lines 100 and 114, from which the various subroutines are called. On entering the main loop, the user determines the circuit supply voltage and the individual resistor values. The values for the voltage drop across each resistor and the individual power dissipations are calculated and displayed next to the appropriate resistor. The user then has the option of trying the same circuit set-up with different values, or selecting a different number of resistors. The various subroutines are labeled with REMarks, and if you like, you can juggle the orders in which they are called, or invent new routines to extend the program. (The object of this series of articles is, after all, to prompt you to design and program your own educational software.)

Note the roundoff routine at line 281. This is used to preclude the attempt to display repeating decimals—a very common occurrence when dealing with three resistors. The VIC has a nasty habit of breaking into exponential notation when extremely high values are generated. The C-64 does not seem to have this problem as often.

While these examples are not elaborate programs, they should give you the idea of the investigative possibilities of simulations. If you have questions or comments on the BASIC Education series, please pass them along through *Commander*.

VIC-20 Version

```
10 REM SERIES RESIST

20 POKE56,29:POKE55,2
   00:CLR

30 FORN=7624TO7679:RE
   ADQ:POKEN,Q:NEXT

31 DATA24,36,66,129,1
   29,66,165,231

32 DATA24,48,96,192,9
   6,48,24,12

33 DATA6,3,6,12,24,48
   ,96,192

34 DATA96,48,24,12,6,
   3,6,12

35 DATA8,28,54,99,193
   ,128,0,0

36 DATA0,1,3,6,140,21
   6,112,32
```

VIC-20 Version

```
1 PRINT''[clr]''SPC(2
  00)''SERIES[sP]RES
  ISTANCE''SPC(93)''
  BY[sP]ANDY[sP]VANC
  sP]DUYNE''

3 FORP=1TO3E3:NEXT
```


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```
37 DATA128,192,96,49,
   27,14,4,0

40 REM SETUP STRINGS

41 H$=''=>?'':V$='':[
   down][left];[down]
   [left]<'':HB$=''[
   rvs-on][shf-*, 3 t
   imes][rvs-off]'':V
   B$=''[rvs-on][shf-
   -][down][left][snf
   --][down][left][sh
   f--][rvs-off]''

42 Z$=''[rvs-on][sp,
   2 times][shf--][sp
   , 7 times][shf--]''
   :BA$=''[rvs-on][sp
   ][shf-*][com-E][sh
   f-*][down, 2 times
   ][left, 2 times][c
   om-R][up, 2 times]
   ''

45 SP$=''[rvs-on][sp,
    11 times]''

46 D$=''[home][down,
   20 times]''

48 S1$=''[rvs-on][sp,
    21 times]''

50 REM GET PARAM

52 PRINT''[clr]HOW[sp
   ]MANY[sp]RESISTORS
   [sp]DO[sp, 2 times
   ]YOU[sp]WANT[sp]IN
   [sp]THE'':INPUT''[
   sp]CIRCUIT[sp](1-3
   )'';HM$

54 IFHM$>''3''ORHM$<''
   1''THEN52

56 HM=VAL(HM$)

60 DIMR$(3):R$(1)=H$:
   R$(2)=VB$:R$(3)=HB
   $

62 IFHM>1THENR$(2)=V$

63 IFHM>2THENR$(3)=H$

64 DIMRE$(3):RE$(1)=''
   [home][down][right
   , 5 times][rvs-on]
   '':RE$(2)=RE$(1)+
   ''[down, 6 times][
   right, 7 times]''

65 RE$(3)=RE$(1)+''[d
   own, 12 times][rvs
   -on]''

99 POKE36869,255

100 REM IT

102 GOSUB200

103 GOSUB210:GOSUB220:
    GOSUB230:GOSUB240

104 PRINT''[down][rvs-
    on]RETURN=[sp]CHAN
    GE[sp]THIS[sp, 4 t
    imes]'←'[sp]=[sp]N
    EW[sp]CIRCUIT'''

110 GETA$:IFA$=''←''TH
    ENPRINT''[clr]'':P
    OKE36869,240:RUN

112 IFA$=CHR$(13)THENP
    RINT''[clr]'':GOTO
    100

114 GOTO110

199 GOTO199

200 REM DRAW CIRC

202 PRINT''[clr][down,
     4 times][rvs-on][
    sp, 2 times][com-A
    ][shf-*, 2 times][
    rvs-off]''R$(1)''[
    rvs-on][shf-*, 2 t
    imes][com-S]''

203 PRINTZ$:PRINTZ$:PR
    INTBA$TAB(10)CHR$(
    146)R$(2)

204 PRINTZ$:PRINTZ$

205 PRINT''[rvs-on][sp
    , 2 times][com-Z][
    shf-*, 2 times][rv
    s-off]''R$(3)''[rv
    s-on][shf-*, 2 tim
    es][com-X]''

206 PRINT''[home][down
    , 5 times][right,
    5 times][rvs-on]R1
    '':IFHM>1THENPRINT
    TAB(8)''[down, 2 t
    imes][rvs-on]R2''

207 IFHM>2THENPRINTTAB
    (5)  [down, 2 time
    s][rvs-on]R3''

209 RETURN

210 REM GET BAT

212 T$=''[rvs-on]BATTE
    RY[sp]VOLTAGE?'':G
    OSUB290

214 BA=VAL(Q$):PRINT''
    [home][down, 8 tim
    es][sp, 4 times][l
    eft, 4 times][rvs-
    on]''BA''[left]V[s
    p]''

219 RETURN

220 REM GET RESIST

221 FORN=1TOHM:T$=''[r
    vs-on]RESISTANCE''
    +STR$(N)+''?'':GOS
    UB290
```


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```
222 PRINTRE$(N)Q$''[rv
    s-off]9'':D(N)=VAL
    (Q$)

223 NEXT

230 REM FIGURE VOLTS

231 FORN=1TOHM:R=BA*(D
    (N)/(D(1)+D(2)+D(3
    ))):GOSUB280

232 E(N)=RO:NEXT

233 R=BA/(D(1)+D(2)+D(
    3)):GOSUB280:I=RO

234 FORN=1TOHM:R=I*E(N
    ):GOSUB280:P(N)=RO
    :NEXT

236 RETURN

240 REM SHOW THINGS

241 FORN=1TOHM:PRINTRE
    $(N)''[down][left]
    ''E(N)''V'':PRINT
    RE$(N)''[down, 2 t
    imes][left]''P(N)''
    W'':NEXT

242 PRINTLEFT$(D$,18)''
    [rvs-on]THE[sp]CIR
    CUIT[sp]CURRENT[sp
    ]IS''I''A.''

243 RETURN

280 REM ROUND

281 R=R*1000:R=INT(R):
    RO=R/1000:RETURN

290 REM INPUT

291 Q$='''':PRINTLEFT$
    (D$,19)T$

292 GETA$:IFA$=CHR$(13
    )THEN298

293 IFA$=CHR$(20)ANDLE
    N(Q$)>0THENQ$=LEFT
    $(Q$,LEN(Q$)-1):GO
    TO297

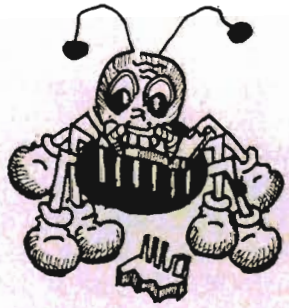
294 IFA$=''.''THEN296

295 IFA$<''0''ORA$>''9
    ''THEN292

296 Q$=Q$+A$

297 PRINTLEFT$(D$,19)T
    $Q$''[sp]'':GOTO29
    2

298 PRINTLEFT$(D$,19)S
    1$:RETURN
```



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```
10 REM SERIES RESIST

15 PRINTCHR$(147)CHR$
   (142)SPC(210)''SER
   IES[sp]RESISTANCE''

16 PRINTSPC(90)''BY[s
   p]ANDY[sp]VAN[sp]D
   UYNE''

20 POKE56,48:POKE52,4
   8:CLR

21 POKE56334,PEEK(563
   34)AND254:POKE1,PE
   EK(1)AND251

22 FORN=0TO1023:POKE1
   2288+N,PEEK(53248+
   N):NEXT

23 POKE1,PEEK(1)OR4:P
   OKE56334,PEEK(5633
   4)OR1

30 FORN=12832TO12887:
   READQ:POKEN,Q:NEXT

31 DATA24,36,66,129,1
   29,66,165,231

32 DATA24,48,96,192,9
   6,48,24,12

33 DATA6,3,6,12,24,48
   ,96,192

34 DATA96,48,24,12,6,
   3,6,12

35 DATA8,28,54,99,193
   ,128,0,0

36 DATA0,1,3,6,140,21
   6,112,32

37 DATA128,192,96,49,
   27,14,4,0

40 REM SETUP STRINGS

41 H$=CHR$(104)+CHR$(
   105)+CHR$(106)

42 V$=CHR$(101)+''[do
   wn][left]''+CHR$(1
   02)+''[down][left]
   ''+CHR$(103)

45 Z$=''[sp, 2 times]
   [shf--][sp, 7 tim
   es][shf--]'':BA$=''
   [sp][shf-*][com-E]
   [shf-*][down, 2 t
   imes][left, 2 time
   s][com-R][up, 2 ti
   mes]''

46 SP$=''[sp, 11 time
   s]''

47 D$=''[home][down,
   20 times]''

48 S1$=''[sp, 21 time
   s]''

50 REM GET PARAM

52 PRINT''[clr]HOW[sp
   ]MANY[sp]RESISTORS
   [sp]DO[sp]YOU[sp]W
   ANT[sp]IN[sp]THE''
   :INPUT''[sp]CIRCUI
   T[sp](1-3)'';HM$

54 IFHM$>''3''ORHM$<''
   1''ORLEN(HM$)>1THE
   N52

56 HM=VAL(HM$)

60 DIMR$(3):R$(1)=H$:
   R$(2)=''[shf--][do
   wn][left][shf--][d
   own][left][shf--]''
   :R$(3)=''[shf-*, 3
    times]''

62 IFHM>1THENR$(2)=V$

63 IFHM>2THENR$(3)=H$

64 DIMRE$(3):RE$(1)=''
   [home][down][right
   , 5 times]'':RE$(2
   )=RE$(1)+''[down,
   6 times][right, 7
   times]''

65 RE$(3)=RE$(1)+''[d
   own, 12 times]''

99 POKE53272,(PEEK(53
   272)AND240)+12

100 REM IT

102 GOSUB200

103 GOSUB210:GOSUB220:
    GOSUB230:GOSUB240

104 PRINT''[down]RETUR
    N=[sp]CHANGE[sp]TH
    IS'':PRINT''←[sp
    ]=[sp]NEW[sp]CIRCU
    IT'''

110 GETA$:IFA$=''←''TH
    ENPRINT''[clr]'':P
    OKE53272,21:RUN40

112 IFA$=CHR$(13)THENP
    RINT''[clr]'':GOTO
    100

114 GOTO110

200 REM DRAW CIRC

202 PRINT''[clr][down,
     4 times][sp, 2 ti
    mes][com-A][shf-*,
     2 times][rvs-off]
    ''R$(1)''[shf-*,
    2 times][com-S]''

203 PRINTZ$:PRINTZ$:PR
    INTBA$TAB(10)R$(2)

204 PRINTZ$:PRINTZ$

205 PRINT''[sp, 2 time
    s][com-Z][shf-*, 2
     times]''R$(3)''[s
    hf-*, 2 times][com
    -X]''

206 PRINT''[home][down
    , 5 times][right,
    5 times]R1'':IFHM>
    1THENPRINTTAB(8)''
    [down, 2 times]R2''

207 IFHM>2THENPRINTTAB
    (5)''[down, 2 time
    s]R3''

209 RETURN

210 REM GET BAT

212 T$=''BATTERY[sp]VO
    LTAGE?'':GOSUB290
```

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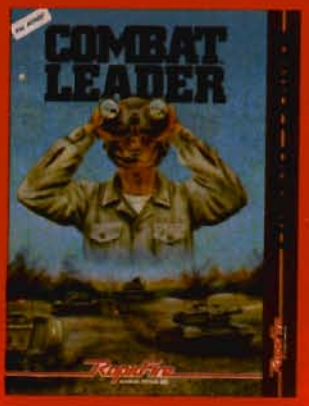

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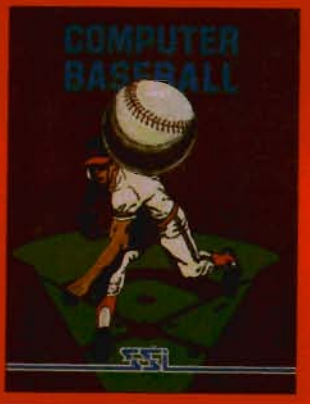

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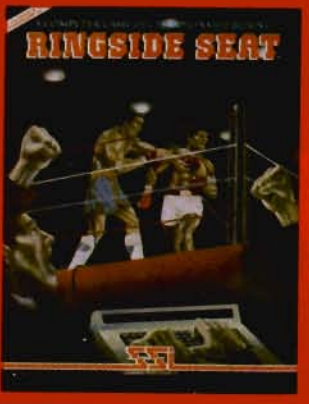

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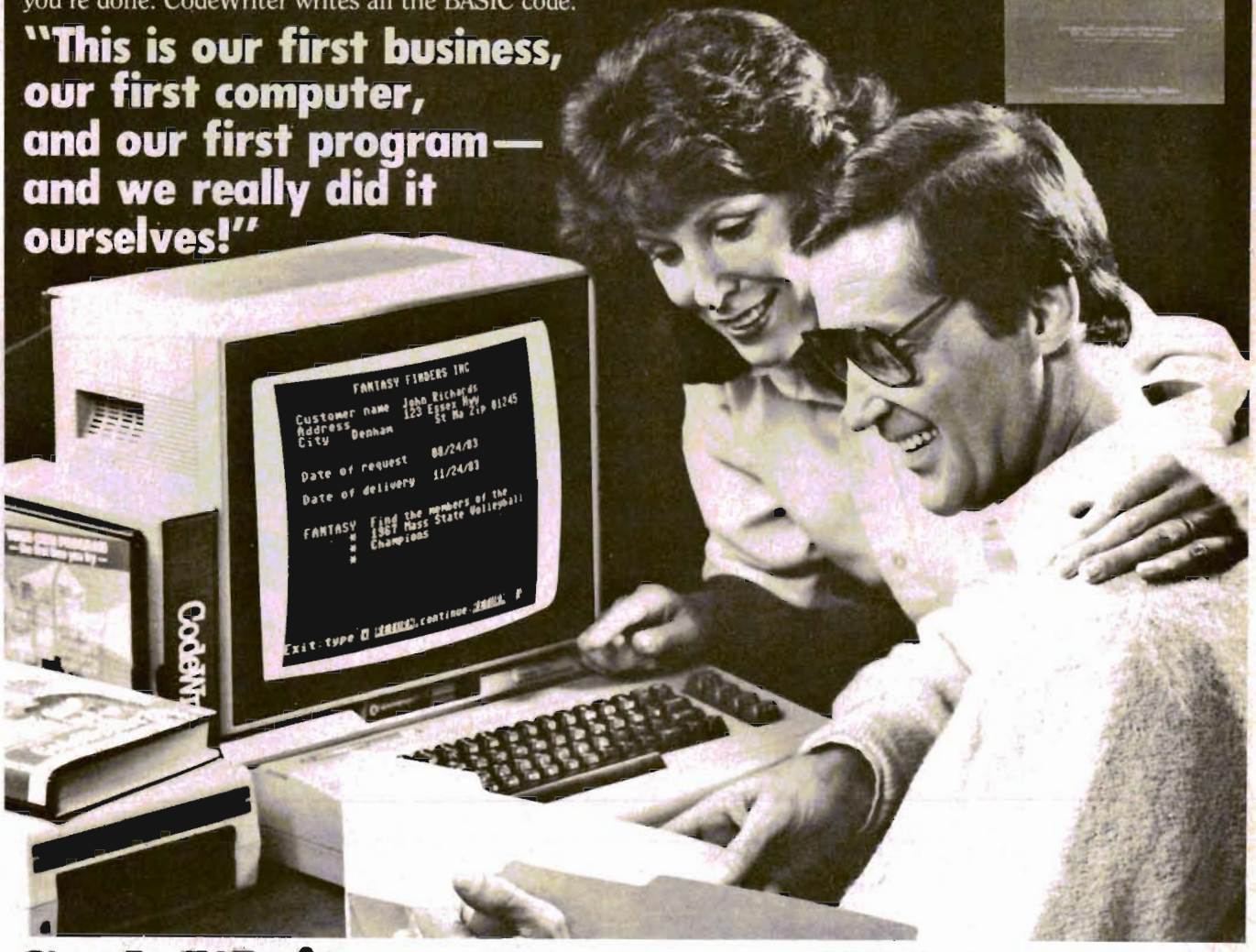

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```
214 BA=VAL(Q$):PRINT''
    [home][down, 8 tim
    es][sp, 4 times][l
    eft, 4 times]''BA''
    [left]V[sp]''

219 RETURN

220 REM GET RESIST

221 FORN=1TOHM:T$=''RE
    SISTANCE''+STR$(N)
    +''?'':GOSUB290

222 PRINTRE$(N)Q$CHR$(
    100):O(N)=VAL(Q$)

223 NEXT

230 REM FIGURE VOLTS

231 FORN=1TOHM:R=BA*(O
    (N)/(O(1)+O(2)+O(3
    ))):GOSUB280

232 E(N)=RO:NEXT

233 R=BA/(O(1)+O(2)+O(
    3)):GOSUB280:I=RO

234 FORN=1TOHM:R=I*E(N
    ):GOSUB280:P(N)=RO
    :NEXT

236 RETURN

240 REM SHOW THINGS

241 FORN=1TOHM:PRINTRE
    $(N)''[down][left]
    ''E(N)''V'':PRINT
    RE$(N)''[down, 2 t
    imes][left]''P(N)''
    W'':NEXT

242 PRINTLEFT$(D$,18)''
    THE[sp]CIRCUIT[sp]
    CURRENT[sp]IS''I''
    A.''

243 RETURN
280 REM ROUND
281 R=R*10000:R=INT(R)
    :RO=R/10000:RETURN

290 REM INPUT

291 Q$='''':PRINTLEFT$
    (D$,19)T$

292 GETA$:IFA$=CHR$(13
    )THEN298

293 IFA$=CHR$(20)ANDLE
    N(Q$)>0THENQ$=LEFT
    $(Q$,LEN(Q$)-1):GO
    TO297

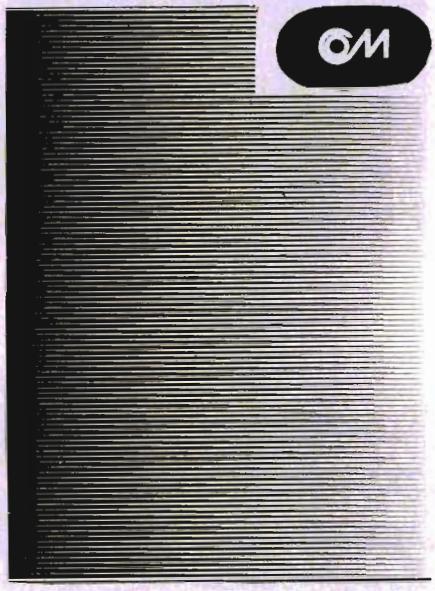
294 IFA$=''.''THEN296

295 IFA$<''0''ORA$>''9
    ''THEN292

296 Q$=Q$+A$

297 PRINTLEFT$(D$,19)T
    $Q$''[sp]'':GOTO29
    2

298 PRINTLEFT$(D$,19)S
    1$:RETURN
```



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Master Wedge
A Disk Programmer's Utility

By Thomas Henry

There is no doubt that the "Universal Wedge" is the most widely known public domain program in the world. The program is supplied free of charge to every purchaser of the 1541 disk drive. However, there may be some newcomers to the microcomputer revolution who have missed out on the "Universal Wedge", so perhaps a few words should be said about what it is and what it does. As a proud Commodore computer owner, you are no doubt aware that Commodore disk drives are among the most versatile units in the world. Unlike many other brands, Commodore disk drives (like the 4040, 8050 and 1541) come with a very complete DOS (disk operating system). It is possible to do many miraculous things with these units, with a minimum of effort from the computer's keyboard. Loading and saving programs, creating sequential or relative files, running directories, scratching files, these and many other operations are easily handled with no overhead from the host computer. To put it simply, Commodore disk drives are completely software programmable. If a certain desired feature doesn't exist, you can generally write a program to provide that feature.

Well, despite all of this excellent flexibility, there are certain operations which, though easy to implement in theory, are rather bothersome in practice. The "Universal Wedge" cuts through this red tape and reduces the number of keystrokes needed to put various commands into practice. As an example, suppose you need to "NEW" or header a disk. You could do an OPEN 1, 8, 15: PRINT#15, "0:name,99":CLOSE1, which would then create the desired disk. That's not too bad, but it sure takes a lot of keystrokes. With the "Universal Wedge" you could accomplish the same goal with @name,99. Much simpler! So, the "Universal Wedge" is a disk programmer's aid, with economy of keystrokes in mind.

Besides Robert Fairbairn's excellent early versions, many other programmers have added various features to the "Wedge". It seems like everyone has an idea for it, and that includes me as well. There were a number of features of the "Universal Wedge" which bothered me a little, so rather than sit back and grumble, I decided to do something about it! The result is this new incarnation of the classic program, which I call the "Master Wedge". Although in many ways it looks similar to the "Universal Wedge", several important changes were made.

MASTER WEDGE: THE COMMANDS

Figure 1 displays a summary of the Master Wedge commands. In general, many of these will look familiar, but don't let this fool you. Many new syntax check and goof-proof routines have been added to make the program the easiest-to-use Wedge ever. And best of all, Master Wedge really economizes on memory. Even with the new features, the program still only takes up 526 bytes of memory.

Let's take a cruise through the command list. There are three different load commands. "/" followed by a filename will load that program into memory. In particular, this type of load should be used with BASIC programs which automatically relocate to the bottom of program memory. On the other hand, if you are contemplating loading a machine language program (which should load only into its original address), then "%" followed by the file name is the command to use. It can be seen, then, that "%" has the same effect as LOAD "filename", 8, 1. Finally, "up-arrow" followed by the file name will load a BASIC program into memory and then run it automatically. This is a very fast and efficient way to get a game rolling for the kids!

"Back-arrow" will save a BASIC program to the disk in the usual format. Note, for all of the three load commands and the save command, the use of quotes is optional. Master Wedge simply ignores them. Also, leading spaces are ignored as are any characters following the close-quote (if used). These features were specifically added to simplify loading a program from the directory. For example, suppose you list up the directory and see

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the program you wish to load. Simply move the cursor up to the proper line, type a "/" (or any other load-save type command), and hit [RETURN]. The spaces before the file name in the listing will be ignored as well. This added feature will really speed up your disk drive work!

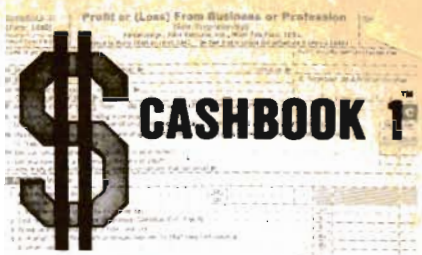
We've already mentioned the directory, but some things to ponder are that this version of the directory is non-destructive to any program in memory. In other words, the directory is listed directly to screen RAM. The command to get this under way is "@$". "@$" will list the entire directory, but you may pause it indefinitely by tapping the space bar once. Tap it again to resume the listing. Note that wild card searches are supported with the use of the characters "?" and "*". Refer to Figure 1 for more details.

You can also send various commands to the disk drive with the "@" command. Figure 1, again, gives the details. This will simplify newing a disk, scratching files, renaming files, validating a disk, and so on. By the way, typing "@" followed by nothing else will return a message from the error channel and turn off the blinking red LED on the disk drive.

Since many VIC-20 and Commodore-64 users are apt to get into using more than one disk drive, provisions have been made in Master Wedge for this. The "@&" command, as detailed in Figure 1, allows you to change the device number for the current drive, through software. To illustrate this, suppose that you have two disk drives hooked up to your computer. As they come from the factory, both drives will respond to the number eight. To get around this limitation, first turn on one drive (leave the other off for the moment). Now type the command "@&9". This changes the device number from eight to nine. Now you have effectively hooked up two drives to the computer, each with its own individual device number. Say goodbye to bus contention!

Obviously, Master Wedge can only talk to one drive at a time. When first initialized, Master Wedge talks to device number eight. But suppose that you have added another drive, as above, with device number nine. You can instruct Master Wedge to talk to it instead by doing the command "@&9". From now on, Master Wedge addresses itself to device number nine.

It's important to realize the distinction between the last two commands described. "9&" changes the device number of the current disk drive, while "@#" changes the drive accessed by Master Wedge. It goes without saying that these two commands should be used carefully and in the proper order, since this added



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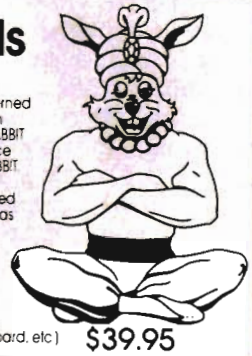

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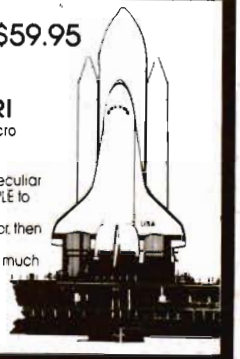

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versatility also makes it possible for you to get all balled up in device numbers! And by the way, the VIC-20 and Commodore-64 computers only like their disk drives to have numbers in the range of eight to fifteen. Master Wedge helps you keep track of this limitation by rejecting any other number.

The last command, "@Q", is literally the last command! "@Q" shuts off Master Wedge, but leaves it protected in memory so that you may return to it at some later time. In the VIC-20 version (see below), after shutting it off, you may return with a SYS1000, an easy number to remember.

HOW MASTER WEDGE WORKS

Figure 2 shows the complete assembler listing for Master Wedge. Not much need be said about the operation of this program since the listing is heavily annotated. Even if you don't expect to use Master Wedge, you might want to look over the listing anyway, since it illustrates a number of valuable machine language disk drive techniques which could well find use in other programs.

Note that equates are given for both the VIC-20 and Commodore-64. Most of the equates are identical for both machines, since the two computers are quite similar in many regards, but a few need to be changed for the Commodore-64 version.

VIC-20 people will want a relocating version of this progrm since their available memory is variable (see below). On the other hand, Commodore-64 users can literally assemble their versions anywhere, since they have memory to burn!

So there you have it, a complete listing of the Master Wedge. It isn't necessary to understand everything about the source code to use the program, but I think you will find it quite an education if you do elect to analyze the code in detail. And you may just find out that programming the disk drive from machine language is actually quite straightforward (and fun!).

A RELOCATING VERSION FOR THE VIC-20

As mentioned, the VIC-20 may have a variable amount of RAM, so it is vital to come up with a version which automatically relocates. This insures that all VIC-20s, regardless of memory expansion, will be able to effectively use the program. Figure 3 shows the object code for a special relocating version of Master Wedge. Let's go through the steps of entering it into your VIC-20.

[1] First, load in a machine language monitor of some sort. This may be a fancy cartridge version, like HESMON or VIC-MON, a commercial tape-loaded one like MACH-20 or even a free, public domain one like MICROMON, SUPERMON or TINYMON. It makes no difference if it is cartridge, tape or disk based or if it is simple or fancy. All we need is the ability to enter hex code and the ability to save it to disk.

[2] After initializing the monitor of your choice, start to enter the hex code shown in Figure 3. Note that it starts at $1200 and ends at $1502. This, of course, assumes that you are using an 8K or larger RAM pack (BASIC starts at $1200 + under these conditions). If you know what you're doing, it is possible to enter the code at $1000 (or even $0400) without using the 8K pack, since the BASIC line link bytes are irrelevant. If you do elect to enter the code at one of these two other positions, then you will have to change the saving procedure slightly. Beginners should keep it simple and enter the code, as indicated, at $1200 while using an 8K (or more) RAM pack.

[3] After entering the code from $1200 to $1502, alter the eight memory contents as shown in Figure 4. If, in step [2], you entered the code at $1000 or $0400, then you will have to change these locations accordingly. These memory addresses, by the way, contain pointers to the end of Master Wedge.

[4] Return to BASIC. Now save the program to disk in the ordinary fashion. Note that because of step [3], the program will save out just as if it were a BASIC program. Assuming you made no typing errors, you are done and ready to use Master Wedge!

Using Master Wedge is simple now. Just LOAD and RUN it! You will note that the hex dump in Figure 3 is fairly large, but after running the program, it relocates itself to the top of memory and compresses down to a mere 526 bytes. In other words, the relocating loader of Master Wedge is fairly hefty, but after it has been used once, it is no longer needed. The "core" then is left behind and is actually quite small. By the way, you may now type NEW to get rid of the remaining loader stuff. Master Wedge is well protected at the top of memory.

So there you have it, a valuable disk programmer's aid for the price of a half hour at the keyboard. Study all of the commands of Master Wedge and see if you don't agree that this new incarnation is easier-to-use, simpler and smaller than the previous versions.

Figure 1

SUMMARY OF MASTER WEDGE COMMANDS

Relocating (normal Basic) Disk Load:
/file name

Non-relocating (machine language) Disk Load:
%file name

Load and Run BASIC Program:
[up-arrow] file name

Save BASIC Program:
[back-arrow] file name

Note: In the above four commands, quotes are optional and leading spaces before the file name are ignored. If quotes are used, then any characters after the close-quote will be ignored. Thus it is possible to list a directory (see below), then move the cursor up to the desired file name, write in the desired command character and hit [return]. Master Wedge will ignore the word "PRG" which normally occurs after a file name listing in a directory.

Directory:

@$	lists whole directory
@$name1*	lists names that start with "name1"
@$n?m?	lists names with wild card for the "?"

Note, the directory listing is non-destructive to programs already in memory. The listing may be paused by tapping the space bar, and resumed in the same fashion.

Change Wedge Default:

@#9	causes Master Wedge to access drive 9 from now on

Change Device Number:

@&9	changes device number of current drive to 9.

Note, in the two change commands, above, legal numbers for defaults and device numbers must be between 8 and 15. Any other number gives a syntax error message.

Send Command to Disk:

@command	sends command to disk

For example, @n0:games,99 will cause the 1541 drive to "NEW" or header the disk with the name "Games" and ID number of 99. @I will cause an initialization, and so on. Refer to your disk drive manual for a list of all possible commands. The @ commands obviates the need to do an OPEN1,8,15: PRINT#1, "0:command".

Quit or turn off Master Wedge:

@Q	turns off wedge, but leaves protected in memory.

In critical speed applications, it is best to turn off Master Wedge before running a program. You may always restart it with a SYS1000.

The character " " may be used interchangeably with the "@" character.

Figure 2

```
MASTER-WEDGE.S......PAGE 0001

LINE# LOC   CODE        LINE


00001  0000             ;*********************************
00002  0000             ;*                               *
00003  0000             ;*   MASTER WEDGE FOR THE        *
00004  0000             ;*  VIC-20 AND COMMODORE 64      *
00005  0000             ;*                               *
00006  0000             ;*       THOMAS HENRY            *
00007  0000             ;*                               *
00008  0000             ;*                               *
00009  0000             ;*                               *
00010  0000             ;*********************************
00011  0000             ;
00012  0000             ;
00013  0000             ;EQUATES FOR THE VIC-20
00014  0000             ;
00015  0000             ;
00016  0000             BASIC  = $2B          ;POINTER TO BASIC START.
00017  0000             VARBLE = $2D          ;START OF VARIABLES.
00018  0000             CHRGET = $73          ;MAIN CHRGET ROUTINE.
00019  0000             CHRGOT = $79          ;RE-GET CURRENT CHARACTER.
00020  0000             STATUS = $90          ;STATUS BYTE 'ST'.
00021  0000             PRGEND = $AE          ;END ADDRESS OF LOADED PRG.
00022  0000             CHRNOS = $B7          ;FILE NAME LENGTH.
00023  0000             SECOND = $B9          ;SECONDARY ADDRESS.
00024  0000             DEVICE = $BA          ;DEVICE NUMBER.
00025  0000             NAMEPT = $BB          ;FILE NAME ADDRESS POINTER.
00026  0000             ASAVE  = $FB          ;TEMPORARY ACC. SAVE.
00027  0000             XSAVE  = $FC          ;TEMPORARY X-REG SAVE.
00028  0000             TEMP   = $FD          ;1 OR 2 BYTE TEMPORARY.
00029  0000             STACK  = $0100        ;CPU STACK AREA.
00030  0000             BUFFER = $0200        ;INPUT BUFFER.
00031  0000             CMDBUF = $033C        ;DISK COMMAND BUFFER.
00032  0000             READY  = $C474        ;RETURN TO BASIC.
00033  0000             WAIT   = $C48C        ;WAITING FOR COMMAND EXIT.
00034  0000             CHAIN  = $C533        ;RELINK BASIC LINES.
00035  0000             CLR    = $C659        ;CLEAR VARIABLES AND STACK.
00036  0000             SETCHR = $C68E        ;SET UP CHRPTR FOR 'RUN'.
00037  0000             RUNPRG = $C7AE        ;RUN PROGRAM IN MEMORY.
00038  0000             ERROR  = $CF08        ;SYNTAX ERROR ROUTINE.
00039  0000             PRLINE = $DDCD        ;PRINT LINE NUMBER.
00040  0000             CSAVE  = $E156        ;SAVE (PARAMS ALREADY SET).
00041  0000             CHDGOT = $E38D        ;ROM COPY OF CHRGOT ROUTINE.
00042  0000             SPRINT = $E742        ;PRINT CHARACTER TO SCREEN.
00043  0000             XOPEN  = $F495        ;OPEN A FILE.
00044  0000             XCLOSE = $F6DA        ;CLOSE A FILE.
00045  0000             SETMSG = $FF90        ;SET KERNAL MESSAGES.
00046  0000             SECLIS = $FF93        ;SECONDARY AFTER LISTEN.
00047  0000             TKSA   = $FF96        ;SECONDARY AFTER TALK.
00048  0000             ACPTR  = $FFA5        ;GET BYTE FROM BUS.
00049  0000             CIOUT  = $FFA8        ;SEND CHARACTER ON BUS.
00050  0000             UNTLK  = $FFAB        ;UNTALK THE DISK.
00051  0000             UNLSN  = $FFAE        ;UNLISTEN THE DISK.
00052  0000             LISTN  = $FFB1        ;SEND LISTEN.
00053  0000             TALK   = $FFB4        ;SEND TALK.
00054  0000             LOADSP = $FFD5        ;LOAD (PARAMS ALREADY SET).
00055  0000             STOP   = $FFE1        ;CHECK FOR STOP KEY.
```

```
MASTER-WEDGE.S.....PAGE 0002

LINE# LOC  CODE       LINE

00056 0000            GETIN  = $FFE4          ;GET A BYTE.
00057 0000            ;
00058 0000            ;
00059 0000            ;CHANGE THESE EQUATES FOR THE C-64
00060 0000            ;
00061 0000            ;
00062 0000            ;READY  = $E386          ;RETURN TO BASIC.
00063 0000            ;WAIT   = $A48C          ;WAITING FOR COMMAND EXIT.
00064 0000            ;CHAIN  = $A533          ;RELINK BASIC LINES.
00065 0000            ;CLR    = $A659          ;CLEAR VARIABLES AND STACK.
00066 0000            ;SETCHR = $A68E          ;SET UP CHRPTR FOR 'RUN'.
00067 0000            ;RUNPRG = $A7AE          ;RUN PROGRAM IN MEMORY.
00068 0000            ;ERROR  = $AF08          ;SYNTAX ERROR ROUTINE.
00069 0000            ;PRLINE = $BDCD          ;PRINT LINE NUMBER.
00070 0000            ;CSAVE  = $E159          ;SAVE (PARAMS ALREADY SET).
00071 0000            ;CHDGOT = $E3A8          ;ROM COPY OF CHRGOT ROUTINE.
00072 0000            ;SPRINT = $E716          ;PRINT CHARACTER TO SCREEN.
00073 0000            ;XOPEN  = $F3D5          ;OPEN A FILE.
00074 0000            ;XCLOSE = $F642          ;CLOSE A FILE.
00075 0000            ;
00076 0000            ;
00077 0000                      *=$6000
00078 6000            ;
00079 6000            ;INITIALIZE THE WEDGE.
00080 6000            ;
00081 6000            ;
00082 6000 A2 02               INITAL LDX #$02          ;INITIALIZE CHRGET TO
00083 6002 BD 06 62            INITAL LDA INSERT,X      ;JUMP TO 'WEDGE'
00084 6005 95 7C               STA CHRGOT+3,X
00085 6007 CA                  DEX
00086 6008 10 F8               BPL INITAL
00087 600A 60                  RTS
00088 600B            ;
00089 600B            ;
00090 600B            ;START OF THE WEDGE INSERT.
00091 600B            ;
00092 600B            ;
00093 600B 85 FB               WEDGE  STA ASAVE         ;SAVE THE ACCUMULATOR.
00094 600D 86 FC               STX XSAVE        ;SAVE THE X-REGISTER.
00095 600F BA                  TSX              ;CHECK TO SEE WHERE
00096 6010 BD 01 01            LDA STACK+1,X    ;WE CAME FROM.
00097 6013 C9 8C               CMP #<WAIT       ;WAITING FOR A COMMAND?
00098 6015 D0 13               BNE COMMON       ;NO, MOVE ON.
00099 6017 BD 02 01            LDA STACK+2,X
00100 601A C9 C4               CMP #>WAIT       ;WAITING FOR A COMMAND?
00101 601C D0 0C               BNE COMMON       ;NO, MOVE ON.
00102 601E A5 FB               LDA ASAVE        ;RESTORE COMMAND CHARACTER.
00103 6020 A2 05               LDX #NUMBER-1    ;INDEX BY NUMBER OF COMMANDS.
00104 6022 DD FA 61            FIND   CMP COMMAN,X      ;FIND THE COMMAND.
00105 6025 F0 11               BEQ FOUND
00106 6027 CA                  DEX
00107 6028 10 F8               BPL FIND
00108 602A A5 FB               COMMON LDA ASAVE         ;COMMON CHRGET OPERATION,
00109 602C A6 FC               LDX XSAVE        ;SO RESTORE REGISTERS.
00110 602E C9 3A               CMP #':          ;COMPLETE NORMAL CHRGET.
```

```
MASTER-WEDGE.S.....PAGE 0003

LINE# LOC  CODE       LINE

00111 6030 B0 03               BCS NOTCOL
00112 6032 4C B0 00            JMP CHRGOT+7
00113 6035 4C BA 00 .          NOTCOL JMP CHRGOT+17
00114 6038 85 FD               FOUND  STA TEMP          ;SAVE THE COMMAND FOR LATER.
00115 603A 20 AD 61            JSR CMDSTR       ;GET THE FILENAME AND LENGTH.
00116 603D 8A                  XECUTE TXA               ;EXECUTE THE COMMAND.
00117 603E 0A                  ASL A
00118 603F AA                  TAX
00119 6040 BD E7 61            LDA ACTION+1,X
00120 6043 48                  PHA
00121 6044 BD E6 61            LDA ACTION,X
00122 6047 48                  PHA
00123 6048 60                  RTS
00124 6049            ;
00125 6049            ;
00126 6049            ;MAIN ACTION ROUTINE FOR WEDGE COMMANDS '>@'
00127 6049            ;
00128 6049            ;
00129 6049 98                  DOIT   TYA              ;NO SUB-COMMAND, SO
00130 604A F0 2E               BEQ RDERR        ;READ THE ERROR CHANNEL.
00131 604C A2 06               LDX #NUMBER      ;CHECK FOR SUB-COMMANDS.
00132 604E BD FA 61            CHKSUB LDA COMMAN,X      ;GET A COMMAND.
00133 6051 F0 08               BEQ SEND         ;MUST BE DOS COMMAND.
00134 6053 CD 3C 03            CMP CMDBUF       ;CHECK FIRST CHARACTER.
00135 6056 F0 E5               BEQ XECUTE       ;BRANCH IF IT MATCHES.
00136 6058 E8                  INX              ;CHECK NEXT ONE.
00137 6059 10 F3               BPL CHKSUB       ;BRANCH ALWAYS.
00138 605B            ;
00139 605B            ;
00140 605B            ;SEND COMMAND TO DISK
00141 605B            ;
00142 605B            ;
00143 605B A5 BA               SEND   LDA DEVICE        ;CAUSE A LISTEN.
00144 605D 20 B1 FF            JSR LISTN
00145 6060 A9 6F               LDA #$6F         ;SEND COMMAND SECONDARY.
00146 6062 85 B9               STA SECOND
00147 6064 20 93 FF            JSR SECLIS
00148 6067 A0 00               LDY #$00
00149 6069 B9 3C 03            NEXT   LDA CMDBUF,Y      ;SEND COMMAND STRING.
00150 606C 20 A8 FF            JSR CIOUT
00151 606F C8                  INY
00152 6070 C4 B7               CPY CHRNOS
00153 6072 90 F5               BCC NEXT         ;KEEP SENDING OR
00154 6074 20 AE FF            JSR UNLSN        ;UN-LISTEN THE DISK.
00155 6077 4C 74 C4            JMP READY
00156 607A            ;
00157 607A            ;
00158 607A            ;READ THE ERROR CHANNEL
00159 607A            ;
00160 607A            ;
00161 607A A5 BA               RDERR  LDA DEVICE        ;CAUSE A TALK.
00162 607C 20 B4 FF            JSR TALK
00163 607F A9 6F               LDA #$6F         ;SEND COMMAND SECONDARY.
00164 6081 85 B9               STA SECOND
00165 6083 20 96 FF            JSR TKSA
```


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```
LINE# LOC    CODE          LINE

00166  6086  20 A5 FF     MORSTR JSR ACPTR        ;GET BYTE FROM DISK.
00167  6089  C9 0D                 CMP #$0D        ;END OF STRING?
00168  608B  F0 06                 BEQ ENDSTR      ;YES, ALL DONE.
00169  608D  20 42 E7              JSR SPRINT      ;NO, PRINT BYTE TO SCREEN.
00170  6090  4C 86 60              JMP MORSTR      ;LOOP FOR MORE OF STRING.
00171  6093  20 42 E7     ENDSTR JSR SPRINT       ;PRINT THE CARRIAGE RETURN.
00172  6096  20 AB FF              JSR UNTLK       ;UN-TALK THE DISK.
00173  6099  4C 74 C4              JMP READY       ;DONE WITH COMMAND.
00174  609C                ;
00175  609C                ;
00176  609C                ;PRINT THE DIRECTORY '@$0:*'
00177  609C                ;
00178  609C                ;
00179  609C  A9 60         DODIR  LDA #$60        ;SECONDARY ADDRESS.
00180  609E  85 B9                 STA SECOND
00181  60A0  20 95 F4              JSR XOPEN       ;OPEN THE FILE.
00182  60A3  A5 BA                 LDA DEVICE      ;GET DEVICE NUMBER.
00183  60A5  20 B4 FF              JSR TALK
00184  60A8  A5 B9                 LDA SECOND      ;GET SECONDARY ADDRESS.
00185  60AA  20 96 FF              JSR TKSA
00186  60AD  A9 00                 LDA #$00
00187  60AF  85 90                 STA STATUS      ;SET STATUS TO ZERO.
00188  60B1  A0 03                 LDY #$03        ;GET PAST LINKS AND ADDR.
00189  60B3  84 B7         NEXLIN STY CHRNOS      ;SAVE THE COUNT.
00190  60B5  20 A5 FF              JSR ACPTR       ;GET BYTES FROM DISK.
00191  60B8  85 FD                 STA TEMP
00192  60BA  20 A5 FF              JSR ACPTR
00193  60BD  85 FE                 STA TEMP+1
00194  60BF  A4 90                 LDY STATUS      ;CHECK STATUS.
00195  60C1  D0 3B                 BNE SHUT        ;BRANCH IF BAD OR DONE.
00196  60C3  A4 B7                 LDY CHRNOS      ;MORE BYTES TO SKIP PAST?
00197  60C5  88                    DEY
00198  60C6  D0 EB                 BNE NEXLIN      ;YES, SKIP SOME MORE.
00199  60C8  A6 FD                 LDX TEMP        ;NO, GOT VALID LINE#.
00200  60CA  A5 FE                 LDA TEMP+1
00201  60CC  20 CD DD              JSR PRLINE      ;PRINT THE LINE NUMBER.
00202  60CF  A9 20                 LDA #$20        ;THEN A SPACE.
00203  60D1  20 42 E7              JSR SPRINT
00204  60D4  20 A5 FF     BODY   JSR ACPTR        ;GET SET TO PRINT
00205  60D7  A6 90                 LDX STATUS      ;BODY OF A FILE NAME.
00206  60D9  D0 23                 BNE SHUT        ;BAD READ, SHUT DOWN.
00207  60DB  C9 00                 CMP #$00        ;END OF LINE, DO NEXT.
00208  60DD  F0 18                 BEQ FINLIN
00209  60DF  20 42 E7              JSR SPRINT
00210  60E2  20 E1 FF              JSR STOP        ;CHECK STOP KEY.
00211  60E5  F0 17                 BEQ SHUT        ;BRANCH IF DEPRESSED.
00212  60E7  20 E4 FF              JSR GETIN       ;DO PAUSE FUNCTION.
00213  60EA  F0 E8                 BEQ BODY
00214  60EC  C9 20                 CMP #$20
00215  60EE  D0 E4                 BNE BODY
00216  60F0  20 E4 FF     PAUSE  JSR GETIN
00217  60F3  F0 FB                 BEQ PAUSE
00218  60F5  D0 DD                 BNE BODY
00219  60F7                ;
00220  60F7  20 E1 61     FINLIN JSR CARRET       ;PRINT CARRIAGE RETURN.
```

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MASTER-WEDGE.S.....PAGE 0005

LINE# LOC   CODE        LINE

00221  60FA  A0 02        LDY #$02        ;SET PAST LINK BYTES.
00222  60FC  D0 B5        BNE NEXLIN      ;BRANCH ALWAYS.
00223  60FE  20 DA F6  SHUT  JSR XCLOSE    ;CLOSE FILE DOWN.
00224  6101  4C 53 61      JMP DONE1       ;ALL DONE!
00225  6104              ;
00226  6104              ;
00227  6104              ;   PROGRAM COMMANDS (PARAMS ALL SET TO $0)
00228  6104              ; ZFILENAME ..... LOAD (NON-RELOCATING)
00229  6104              ; /FILENAME ..... LOAD
00230  6104              ; ^FILENAME ..... LOAD/RUN
00231  6104              ;
00232  6104              ;
00233  6104  A6 2B       LOAD  LDX BASIC       ;SET POINTER FOR RELOCATE.
00234  6106  A4 2C             LDY BASIC+1
00235  6108  A5 FD             LDA TEMP        ;CHECK TYPE OF LOAD.
00236  610A  C9 25             CMP #'%         ;NON-RELOCATING?
00237  610C  D0 03             BNE RELOAD      ;BRANCH IF NOT.
00238  610E  A9 01             LDA #$01        ;SECONDARY FOR NON-RELOCATE.
00239  6110  2C                .BYT $2C        ;SKIP NEXT TWO BYTES.
00240  6111  A9 00       RELOAD LDA #$00       ;SECONDARY FOR RELOCATE.
00241  6113  85 B9             STA SECOND
00242  6115  A9 00             LDA #$00
00243  6117  20 D5 FF          JSR LOADSP      ;LOAD THE PROGRAM.
00244  611A  B0 34             BCS DONE        ;LOAD ERROR!
00245  611C  A5 FD             LDA TEMP        ;CHECK TYPE OF LOAD.
00246  611E  C9 25             CMP #'%         ;IS IT NON-RELOCATING?
00247  6120  F0 2E             BEQ DONE        ;YES, THEN ALL DONE.
00248  6122  A5 AF             LDA PRGEND+1    ;OTHERWISE, SET BASIC
00249  6124  85 2E             STA VARBLE+1    ;POINTERS FOR NEW PROGRAM.
00250  6126  A5 AE             LDA PRGEND
00251  6128  85 2D             STA VARBLE
00252  612A  20 59 C6          JSR CLR         ;FIX UP POINTERS.
00253  612D  20 33 C5          JSR CHAIN       ;THEN FIX UP LINK BYTES.
00254  6130  A5 FD             LDA TEMP        ;CHECK FOR LOAD OR RUN.
00255  6132  C9 2F             CMP #'/         ;IS IT LOAD ONLY?
00256  6134  F0 1A             BEQ DONE        ;YES, ALL DONE.
00257  6136  A9 00             LDA #$00        ;NO KERNAL MESSAGES.
00258  6138  20 90 FF          JSR SETMSG
00259  613B  20 BE C6          JSR SETCHR      ;GET SET FOR 'RUN'.
00260  613E  4C AE C7          JMP RUNPRG      ;RUN PROGRAM.
00261  6141              ;
00262  6141              ;
00263  6141              ;QUIT COMMAND '@Q'
00264  6141              ;
00265  6141              ;
00266  6141  A2 02       QUIT  LDX #$02
00267  6143  BD 90 E3    REST  LDA CHDGOT+3,X  ;RESTORE NORMAL CHRSET.
00268  6146  95 7C             STA CHRGOT+3,X
00269  6148  CA                DEX
00270  6149  10 F8             BPL REST
00271  614B  30 06             BMI DONE1
00272  614D              ;
00273  614D              ;
00274  614D              ;SAVE COMMAND '_FILENAME'
00275  614D              ;
```

```
MASTER-WEDGE.S.....PAGE 0006

LINE# LOC   CODE        LINE

00276  614D              ;
00277  614D  20 56 E1    SAVE  JSR CSAVE       ;CALL SAVE ROUTINE PAST PARSE.
00278  6150  20 E1 61    DONE  JSR CARRET
00279  6153  4C 74 C4    DONE1 JMP READY
00280  6156              ;
00281  6156              ;
00282  6156              ;CHANGE WEDGE DEFAULT '@$9'
00283  6156              ;
00284  6156              ;
00285  6156  20 7F 61    CHGWEG JSR GETNUM     ;GET DEFAULT PARAMETER.
00286  6159  8D 05 62          STA DEVDEF      ;THEN STORE IT.
00287  615C  D0 F5             BNE DONE1       ;BRANCH ALWAYS.
00288  615E              ;
00289  615E              ;
00290  615E              ;CHANGE DEVICE NUMBER '@$9'
00291  615E              ;
00292  615E              ;
00293  615E  20 7F 61    CHGDEV JSR GETNUM     ;GET NEW DEVICE NUMBER.
00294  6161  18                CLC
00295  6162  69 20             ADC #32
00296  6164  8D 42 03          STA CMDBUF+6
00297  6167  69 20             ADC #32
00298  6169  8D 43 03          STA CMDBUF+7
00299  616C  A2 05             LDX #$05
00300  616E  BD 09 62    PUTSTR LDA CHGPAR,X   ;PUT COMMAND STRING IN.
00301  6171  9D 3C 03          STA CMDBUF,X
00302  6174  CA                DEX
00303  6175  10 F7             BPL PUTSTR
00304  6177  A0 08             LDY #$08
00305  6179  20 D1 61          JSR NONAME      ;SET UP COMMAND STRING.
00306  617C  4C 5B 60          JMP SEND
00307  617F              ;
00308  617F              ;
00309  617F              ;GET NUMERIC PARAMETER
00310  617F              ;
00311  617F              ;
00312  617F  A4 B7       GETNUM LDY CHRNOS
00313  6181  88                DEY
00314  6182  F0 26             BEQ SYNERR      ;NO PARAMETER GIVEN.
00315  6184  B9 3C 03          LDA CMDBUF,Y
00316  6187  29 0F             AND #$0F        ;CONVERT ASCII TO BINARY.
00317  6189  85 FD             STA TEMP
00318  618B  88                DEY
00319  618C  F0 12             BEQ GOTNUM      ;ONLY ONE DIGIT.
00320  618E  B9 3C 03          LDA CMDBUF,Y
00321  6191  29 0F             AND #$0F
00322  6193  F0 0B             BEQ GOTNUM
00323  6195  A8                TAY             ;USE FIRST DIGIT AS COUNT.
00324  6196  A5 FD             LDA TEMP
00325  6198  18                CLC
00326  6199  69 0A       DECIM ADC #10         ;ADD 10 FOR EACH COUNT.
00327  619B  88                DEY
00328  619C  D0 FB             BNE DECIM
00329  619E  85 FD             STA TEMP        ;SAVE RESULT.
00330  61A0  A5 FD       GOTNUM LDA TEMP
```

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MASTER-WEDGE.S.....PAGE 0007

LINE# LOC   CODE        LINE


00331  61A2  C9 08           CMP #$08
00332  61A4  90 04           BCC SYNERR
00333  61A6  C9 10           CMP #$10
00334  61A8  90 36           BCC OKAY
00335  61AA  4C 08 CF  SYNERR JMP ERROR
00336  61AD                 ;
00337  61AD                 ;
00338  61AD                 ;GET COMMAND STRING INTO BUFFER
00339  61AD                 ;
00340  61AD                 ;
00341  61AD  A0 00      CMDSTR LDY #$00
00342  61AF  20 73 00          JSR CHRGET      ;IGNORE LEADING SPACES.
00343  61B2  F0 1D             BEQ NONAME      ;NO NAME GIVEN.
00344  61B4  48                PHA             ;SAVE START CHARACTER.
00345  61B5  A9 60             LDA #$60        ;DISABLE BLANK SKIPPER.
00346  61B7  85 7C             STA CHRGOT+3
00347  61B9  68                PLA             ;RESTORE FIRST CHARACTER.
00348  61BA  C9 22             CMP #'"         ;IGNORE LEADING QUOTE.
00349  61BC  D0 09             BNE STORIT
00350  61BE  20 73 00  FILL    JSR CHRGET      ;GET CHARACTER.
00351  61C1  F0 0A             BEQ SETLEN
00352  61C3  C9 22             CMP #'"         ;IGNORE CLOSING QUOTE.
00353  61C5  F0 06             BEQ SETLEN
00354  61C7  99 3C 03  STORIT STA CMDBUF,Y     ;SAVE IT IN 'FILE'.
00355  61CA  C8                INY
00356  61CB  10 F1             BPL FILL
00357  61CD  A9 4C      SETLEN LDA #$4C        ;RESTORE CHRGET.
00358  61CF  85 7C             STA CHRGOT+3
00359  61D1  84 B7      NONAME STY CHRNOS      ;SAVE LENGTH.
00360  61D3  A9 3C             LDA #<CMDBUF    ;GET FILENAME ADDRESS.
00361  61D5  85 BB             STA NAMEPT
00362  61D7  A9 03             LDA #>CMDBUF
00363  61D9  85 BC             STA NAMEPT+1
00364  61DB  AD 05 62          LDA DEVDEF      ;SET DEVICE NUMBER.
00365  61DE  85 BA             STA DEVICE
00366  61E0  60        OKAY    RTS
00367  61E1                 ;
00368  61E1                 ;
00369  61E1                 ;DO A CARRIAGE RETURN
00370  61E1                 ;
00371  61E1                 ;
00372  61E1  A9 0D      CARRET LDA #$0D
00373  61E3  4C 42 E7          JMP SPRINT
00374  61E6                 ;
00375  61E6                 ;
00376  61E6                 ;COMMAND ACTION ADDRESSES
00377  61E6                 ;
00378  61E6                 ;
00379  61E6  03 61      ACTION .WORD LOAD-1     ;% NON-RELOCATING LOAD.
00380  61E8  03 61             .WORD LOAD-1     ;/ RELOCATING LOAD.
00381  61EA  03 61             .WORD LOAD-1     ;^ BASIC LOAD AND RUN.
00382  61EC  4C 61             .WORD SAVE-1     ;_ BASIC SAVE.
00383  61EE  48 60             .WORD DOIT-1     ;> DISK COMMAND.
00384  61F0  48 60             .WORD DOIT-1     ;@ DISK COMMAND.
00385  61F2  55 61             .WORD CHGWEB-1   ;@ CHANGE WEDGE DEFAULT.
```

```
MASTER-WEDGE.S.....PAGE 0008

LINE# LOC   CODE        LINE


00386  61F4  40 61             .WORD QUIT-1     ;Q QUIT
00387  61F6  9B 60             .WORD DODIR-1    ;$ DIRECTORY
00388  61F8  5D 61             .WORD CHGDEV-1   ;% CHANGE DEVICE NUMBER
00389  61FA                 ;
00390  61FA                 ;
00391  61FA                 ;DATA AND COMMAND LIST
00392  61FA                 ;
00393  61FA                 ;
00394  61FA                 NUMBER = 6              ;NUMBER OF MAIN COMMANDS.
00395  61FA  25 2F          COMMAN .BYTE '%/^_>@$Q',$00
00395  6204  00
00396  6205  08           DEVDEF .BYTE $08        ;CURRENT DEFAULT DEVICE.
00397  6206  4C 0B 60      INSERT JMP WEDGE        ;OVERLAY FOR Z-PAGE 'CHRGOT'
00398  6209  4D 2D 57      CHGPAR .BYTE 'M-W',119,0,2
00398  620C  77
00398  620D  00
00398  620E  02
00399  620F                       .END

ERRORS = 00000

SYMBOL TABLE

SYMBOL VALUE
 ACPTR    FFA5   ACTION   61E6   ASAVE    00FB   BASIC    002B
 BODY     60D4   BUFFER   0200   CARRET   61E1   CHAIN    C533
 CHDGOT   E38D   CHGDEV   615E   CHGPAR   6209   CHGWEB   6156
 CHKSUB   604E   CHRGET   0073   CHRGOT   0079   CHRNOS   00B7
 CIOUT    FFA8   CLR      C659   CMDBUF   033C   CMDSTR   61AD
 COMMAN   61FA   COMMON   602A   CSAVE    E156   DECIM    6199
 DEVDEF   6205   DEVICE   00BA   DODIR    609C   DOIT     6049
 DONE     6150   DONE1    6153   ENDSTR   6093   ERROR    CF08
 FILL     61BE   FIND     6022   FINLIN   60F7   FOUND    6038
 GETIN    FFE4   GETNUM   617F   GOTNUM   61A0   INITAL   6002
 INSERT   6206   LISTN    FFB1   LOAD     6104   LOADSP   FFD5
 MORSTR   6086   NAMEPT   00BB   NEXLIN   60B3   NEXT     6069
 NONAME   61D1   NOTCOL   6035   NUMBER   0006   OKAY     61E0
 PAUSE    60F0   PRGEND   00AE   PRLINE   DDCD   PUTSTR   616E
 QUIT     6141   RDERR    607A   READY    C474   RELOAD   6111
 REST     6143   RUMPRG   C7AE   SAVE     614D   SECLIB   FF93
 SECOND   00B9   SEND     605B   SETCHR   C68E   SETLEN   61CD
 SETMSG   FF90   SHUT     60FE   SPRINT   E742   STACK    0100
 STATUS   0090   STOP     FFE1   STORIT   61C7   SYNERR   61AA
 TALK     FFB4   TEMP     00FD   TKSA     FF96   UNLSN    FFAE
 UNTLK    FFAB   VARBLE   002D   WAIT     C48C   WEDGE    600B
 XCLOSE   F6DA   XECUTE   603D   XOPEN    F495   XSAVE    00FC

END OF ASSEMBLY
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64	Accounts RCV. (Comm)	D	$36.57
20/64	Numeric Keypad (Cardco)		$34.96
64	Totl Text ..... T $29.96	D	$33.96
64	Totl Speller	D	$28.96
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Figure 3

```
C*
     PC   IRQ   SR AC XR YR SP
.;  B780 E455 34 33 38 36 F8
.
.:  1200 00 22 12 0A 00 99 22 93
.:  1208 11 12 4D 41 53 54 45 52
.:  1210 20 57 45 44 47 45 20 49
.:  1218 53 20 4F 4E 20 4E 4F 57
.:  1220 22 00 3C 12 14 00 99 22
.:  1228 20 20 20 42 59 20 54 48
.:  1230 4F 4D 41 53 20 48 45 4E
.:  1238 52 59 22 00 54 12 1E 00
.:  1240 9E 32 35 36 AC C2 28 34
.:  1248 34 29 AA C2 28 34 33 29
.:  1250 AA 38 35 00 00 00 A5 2D
.:  1258 85 22 A5 2E 85 23 A5 37
.:  1260 85 24 A5 38 85 25 A0 00
.:  1268 A5 22 D0 02 C6 23 C6 22
.:  1270 B1 22 D0 3C A5 22 D0 02
.:  1278 C6 23 C6 22 B1 22 F0 21
.:  1280 85 26 A5 22 D0 02 C6 23
.:  1288 C6 22 B1 22 18 65 24 AA
.:  1290 A5 26 65 25 48 A5 37 D0
.:  1298 02 C6 38 C6 37 68 91 37
.:  12A0 8A 48 A5 37 D0 02 C6 38
.:  12A8 C6 37 68 91 37 18 90 B6
.:  12B0 C9 BF D0 ED A5 37 85 33
.:  12B8 8D E9 03 A5 38 85 34 8D
.:  12C0 EA 03 A9 4C 8D E8 03 6C
.:  12C8 37 00 BF A2 02 BD F7 FF
.:  12D0 00 95 7C CA 10 F8 60 85
.:  12D8 FB 86 FC BA BD 01 01 C9
.:  12E0 8C D0 13 BD 02 01 C9 C4
.:  12E8 D0 0C A5 FB A2 05 DD EB
.:  12F0 FF 00 F0 11 CA 10 F8 A5
.:  12F8 FB A6 FC C9 3A B0 03 4C
.:  1300 80 00 00 4C 8A 00 00 85
.:  1308 FD 20 9E FF 00 8A 0A AA
.:  1310 BD D8 FF 00 48 BD D7 FF
.:  1318 00 48 60 98 F0 2E A2 06
.:  1320 BD EB FF 00 F0 08 CD 3C
.:  1328 03 F0 E5 E8 10 F3 A5 BA
.:  1330 20 B1 FF A9 6F 85 B9 20
.:  1338 93 FF A0 00 00 B9 3C 03
.:  1340 20 A8 FF C8 C4 B7 90 F5
.:  1348 20 AE FF 4C 74 C4 A5 BA
.:  1350 20 B4 FF A9 6F 85 B9 20
.:  1358 96 FF 20 A5 FF C9 0D F0
.:  1360 06 20 42 E7 4C 77 FE 00
.:  1368 20 42 E7 20 AB FF 4C 74
.:  1370 C4 A9 60 85 B9 20 95 F4
.:  1378 A5 BA 20 B4 FF A5 B9 20
.:  1380 96 FF A9 00 00 85 90 A0
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.
.: 1388 03 84 B7 20 A5 FF 85 FD
.: 1390 20 A5 FF 85 FE A4 90 D0
.: 1398 3B A4 B7 88 D0 EB A6 FD
.: 13A0 A5 FE 20 CD DD A9 20 20
.: 13A8 42 E7 20 A5 FF A6 90 D0
.: 13B0 23 C9 00 00 F0 18 20 42
.: 13B8 E7 20 E1 FF F0 17 20 E4
.: 13C0 FF F0 E8 C9 20 D0 E4 20
.: 13C8 E4 FF F0 FB D0 DD 20 D2
.: 13D0 FF 00 A0 02 D0 B5 20 DA
.: 13D8 F6 4C 44 FF 00 A6 2B A4
.: 13E0 2C A5 FD C9 25 D0 03 A9
.: 13E8 01 2C A9 00 00 85 B9 A9
.: 13F0 00 00 20 D5 FF B0 34 A5
.: 13F8 FD C9 25 F0 2E A5 AF 85
.: 1400 2E A5 AE 85 2D 20 59 C6
.: 1408 20 33 C5 A5 FD C9 2F F0
.: 1410 1A A9 00 00 20 90 FF 20
.: 1418 8E C6 4C AE C7 A2 02 BD
.: 1420 90 E3 95 7C CA 10 F8 30
.: 1428 06 20 56 E1 20 D2 FF 00
.: 1430 4C 74 C4 20 70 FF 00 8D
.: 1438 F6 FF 00 D0 F5 20 70 FF
.: 1440 00 18 69 20 8D 42 03 69
.: 1448 20 8D 43 03 A2 05 BD FA
.: 1450 FF 00 9D 3C 03 CA 10 F7
.: 1458 A0 08 20 C2 FF 00 4C 4C
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.: 1460 FE 00 A4 B7 88 F0 26 B9
.: 1468 3C 03 29 0F 85 FD 88 F0
.: 1470 12 B9 3C 03 29 0F F0 0B
.: 1478 A8 A5 FD 18 69 0A 88 D0
.: 1480 FB 85 FD A5 FD C9 08 90
.: 1488 04 C9 10 90 36 4C 08 CF
.: 1490 A0 00 00 20 73 00 00 F0
.: 1498 1D 48 A9 60 85 7C 68 C9
.: 14A0 22 D0 09 20 73 00 00 F0
.: 14A8 0A C9 22 F0 06 99 3C 03
.: 14B0 C8 10 F1 A9 4C 85 7C 84
.: 14B8 B7 A9 3C 85 BB A9 03 85
.: 14C0 BC AD F6 FF 00 85 BA 60
.: 14C8 A9 0D 4C 42 E7 F4 FE 00
.: 14D0 F4 FE 00 F4 FE 00 3D FF
.: 14D8 00 39 FE 00 39 FE 00 46
.: 14E0 FF 00 31 FF 00 8C FE 00
.: 14E8 4E FF 00 25 2F 5E 5F 3E
.: 14F0 40 23 51 24 26 00 00 08
.: 14F8 4C FC FD 00 4D 2D 57 77
.: 1500 00 00 02 AA AA AA AA AA
```

Figure 4

```
C*
     PC   IRQ   SR AC XR YR SP
.; B780 E455 34 33 38 36 F8
.
.: 002B 01 12 03 15 03 15 03 15
```


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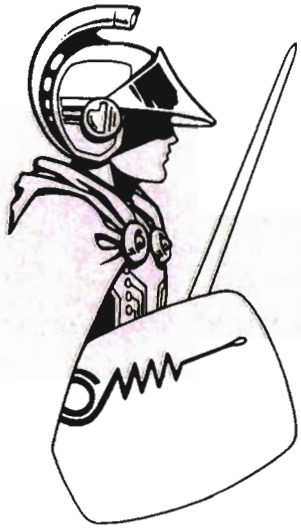

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B*A*S*I*C Training

Beginners' Introduction to Commodore BASIC Programming

By Jonathan Secaur

Does this sound familiar? Your new C-64 or VIC-20 is all set up, plugged in, and turned on. Your aching "joystick wrist" tells you that it's time to swear off games for awhile.

You've gone through the User's Guide and have copied all the cute little demo programs that you can stand. As you stare at the keyboard, you're eager to start writing your own programs.

Where should you begin? You type in a 1 and a Ø. (Everyone knows that all BASIC programs start with line 1Ø, right?) What next?

If you're not sure, then you'll undoubtedly benefit from our series for beginning programmers, starting with this month's installment. Written by an educator who has opened up the world of Commodore computing to hundreds of schoolchildren and adults, this approach is designed to involve you actively each step of the way, as in a "hands-on" computer laboratory. To get the most out of it, sit down at your computer, and be sure to have a pencil handy.

Lesson 1

The PRINT Statement

1) Print is probably the most commonly used word in the BASIC language, so it's good place to start learning. Type in each of these expressions, press the [RETURN] key after each one, and write down the computer's response. Answers are given at the end of this article, but don't peek until you have completed each section.

PRINT 35 _____

PRINT 3 + 5 _____

PRINT3 + 5 _____
(Notice–no space after PRINT)

? 3 * 5 _____

PRINT "NERD" _____

PRINT NERD _____

PR INT "ANOTHER NERD" _____
(Notice space)

PIRNT "THIRD NERD" _____
(Notice misspelling)

PRINT "ONLY ONE QUOTATION MARK _____

PRINT 1 + 2*3 _____

PRINT (1 + 2)*3 _____

2. Now answer the next questions with T for true or F for false, based on your observations of how the computer responded in the previous examples.

a) _____ PRINT is very commonly used in computer programming.

b) _____ If the word PRINT is followed by a math problem, the computer will print the answer.

c) _____ In a math problem, you need a space between each number or sign.

d) _____ Spaces in the word PRINT do not matter to the computer.

e) _____ The word PRINT needs to be followed by a space.

f) _____ The computer will print anything between quotation marks just as it is.

g) _____ If you want to print a word or phrase, you need quotes on both ends.

h) _____ A question mark means the same thing as PRINT.

i) _____ The computer always adds before it multiplies.

j)_____ Parentheses () can make the computer add before it multiplies.

For any False answers, correct the statements so that they are True, for future reference.

3) You may need some more background to answer questions i and j. If you give the computer math problems to do, it will always work from left to right, multiplying or dividing before it adds or subtracts. If you want the computer to work in some other order, then you can put what you want done first in parentheses.

Let's say you want to add 6 plus 2, and then multiply that number by 3. If you tell the computer PRINT 6 + 2 * 3 (try it!) you won't get the answer you expect, 24. Instead you'll get 12 because the computer multiplies 2 times 3 to get 6 and *then* adds 6 to get 12.

Insert parentheses in the next problem so that the computer will add 6 and 4, then multiply that by the sum of 3.5 and 2, and then divide the whole thing by 8:

PRINT 6 + 4 * 3.5 + 2 / 8

4) There's still one PRINT statement from the first section that may be mysterious. When you told the computer to PRINT "NERD", it printed the word NERD just like you would expect. But when you typed in PRINT NERD, the computer's response was a zero rather than the word. (Check your answer to be sure that's what happened.)

To see why that happened, type in

NERD = 3 (press [RETURN])

PRINT NERD (press [RETURN])

The word NERD is being used as a *numeric variable* because it can vary in value and equal any number we want. This time, we set NERD equal to 3; when the computer is told to PRINT NERD, it prints the *value* of NERD, and not the word itself. Before, we hadn't assigned NERD a value, so the computer printed a zero, since it initially assigns 0 to all numeric variables.

To review: if you wanted the computer to print the word NERD, what would you type?

_____

Now any word that's *not* a regular BASIC statement word like PRINT can be used as a variable. (Think about that–if you were a computer and your owner typed in PRINT = 9, and then PRINT PRINT, it could get confusing. Did you ever hear the Abbott and Costello routine about "Who's on first"?)

5) There is one more problem with variable names. Type in these lines, pressing [RETURN] after each one, and record what happens.

NERD = −34.54
NEMO = 5
PRINT NERD

What did the computer print? _____

You see, entire words like NEMO and NERD can be used as variable names, but Commodore BASIC, like most other versions, only recognizes the *first two* letters. To the computer, what you just typed in was read as NE = −34.54, then NE = 5, so it printed the current value of NE, which was 5.

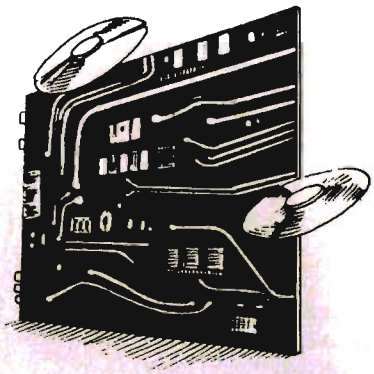
Here's a bonus question for you. NEMO and NERD are fine variable names, but the computer would reject names like NEON and NEANDERTHAL. Why?

How did you do?

Answers to Lesson 1 questions:

1) 35, 8, 8, 15, NERD, 0, ?SYNTAX ERROR, ?SYNTAX ERROR, ONLY ONE QUOTATION MARK, 7, 9
2) a-T, b-T, c-F, d-F, e-F, f-T, g-F (although it's good practice to use quotes on both ends), h-T (a good shortcut), i-F, j-T
3) PRINT (6 + 4)*(3.5 + 2) / 8
4) PRINT "NERD"
5) 5

Bonus: NEON and NEANDERTHAL contain the hidden BASIC words, ON and AND, respectively, so the computer is confused by them.



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Mancala
A Mind-Expanding VIC-20 Game

By Arthur J. Dudley

Mancala may be the oldest game in history, according to Sir Edmund Hoyle, the noted authority on games. Played by the Egyptians around the year 1400 B.C., it has spread to various cultures throughout time. Today, there are numerous variations of the original version being played in many Indonesian and African nations.

When I was introduced to Mancala, I was intrigued by how this game could capture a player's interest despite its simplistic nature. Usually played with beans and a clay board, this game demands the utmost in skill and concentration.

Another characteristic of Mancala, besides providing hours of entertainment, is its ability to teach children how to count. As a matter of fact, it was used by ancient civilizations as a learning tool for children.

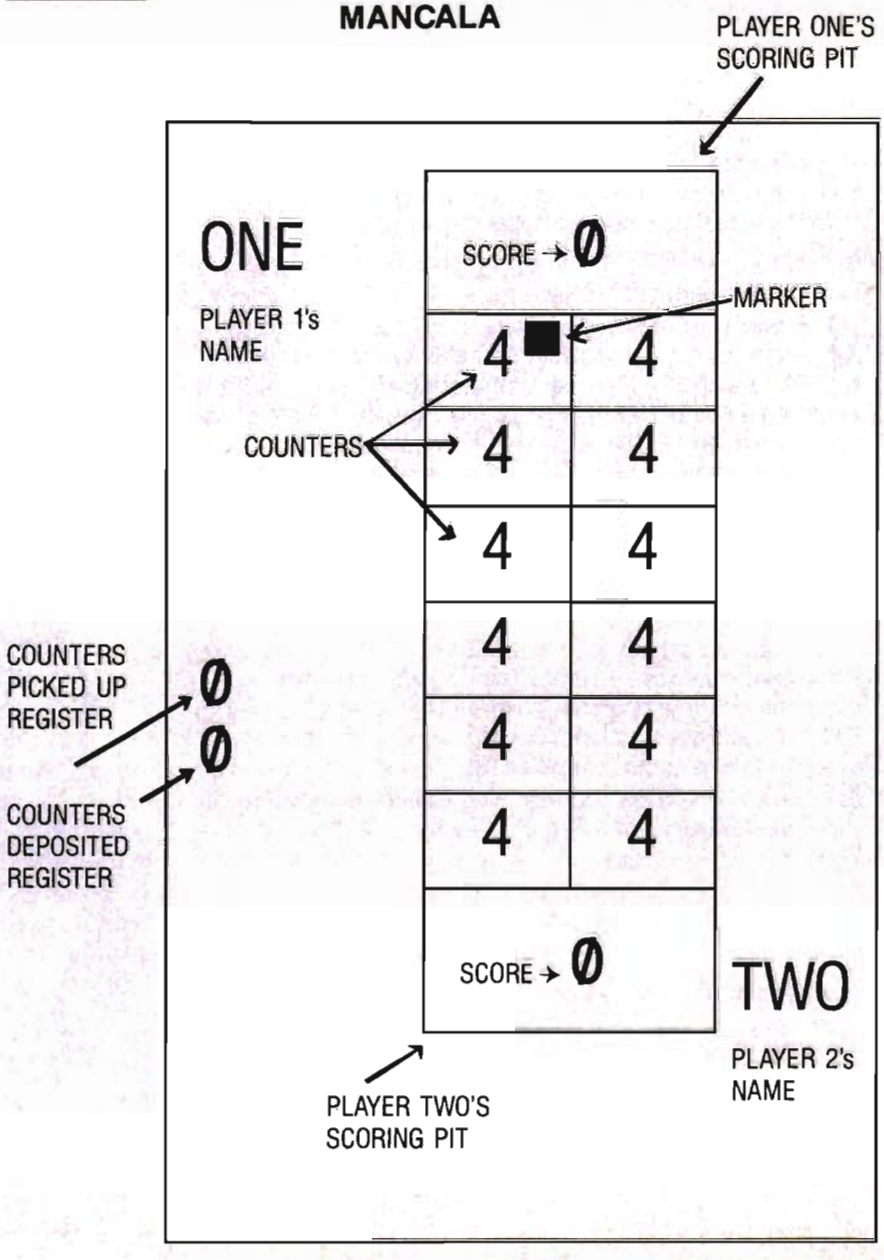
While writing the program to play Mancala on my VIC, I noticed a very interesting contrast–an ancient and simple game being played in the most modern of ways.

TO BEGIN

Load the program in the normal manner and enter RUN. You will then see a display requesting you to enter each player's name. After this is accomplished the game board will be displayed (See Figure 1).

The numbers inside each space represent counters. The left column of spaces belongs to player one, and the right column of spaces to player two. Each player starts off with 24 counters; four counters in each space. The large spaces on the top and bottom display each player's scores (these spaces are called scoring pits). The top scoring pit belongs to player one; the bottom to player two. The checkerboard located in the top-left space is used to keep track of a player's location on the board.

FIGURE 1



CONTROLS

Function key one (f1)	Moves the marker in a clockwise direction.
Function key three (f3) . .	Moves the marker in a counter-clockwise direction.
Function key five (f5)	Picks up the counters in the space designated by the marker.

OBJECT OF THE GAME

To capture your opponent's counters and place them in your scoring pit.

TO PLAY

1. Player number one will always start first.
2. Position the marker using the f1 or f3 function keys to the space of your choice.
3. Press the f5 function key to pick up the counters in the space designated by the marker. A Player cannot cross over to the opponent's side until acquiring the appropriate number of counters (see note in #5).
4. After the counters have been picked up (by pressing f5) the number and marker will disappear from the screen. You will then see that number transferred over to the "counters picked up" register on the left side of your display.
5. Deposit the counters one at a time in succession in the *counter-clockwise direction* by pressing the f3 function key. As you deposit each counter the "counters deposited" register will increment by one. You can use this register to keep track of your counters and also use it for teaching young children how to count.

Note: *You must deposit at least one counter in your opponent's section.* If this cannot be done with the number of counters designated by your marker, the program will prevent you from picking up those counters.

6. After the last counter has been deposited, control will then transfer to your opponent. (The same function keys are utilized by your opponent.)

SCORING

To score, you must deposit your last counter in your opponent's space that already contains no more than one counter (this does not include the counter you are depositing). You will then acquire all the counters in that last space including the counter you deposited. You will also acquire any counters, going back in a clockwise direction, located in spaces having less than three counters. This process will continue until you encounter a space with three or more counters.

Note: You can only capture counters on your opponent's side.

TO WIN

When a player can no longer reach his opponent's side (not enough counters in any of his spaces) the game has ended. The player with the highest number of counters in his scoring pit is the winner.

TO END

Because of memory limitations, a message indicating "end of game" was not provided. To break out of the program after completing a game, press the RUN/STOP key and the RESTORE key at the same time.

I believe games of this nature are an ideal pasttime for the entire family. Because of their simplistic structure they are relatively easy to learn and fun to play. But behind that relatively simple structure lies a challenge a gamester cannot ignore. So test your skills and play Mancala. I hope you will enjoy it.

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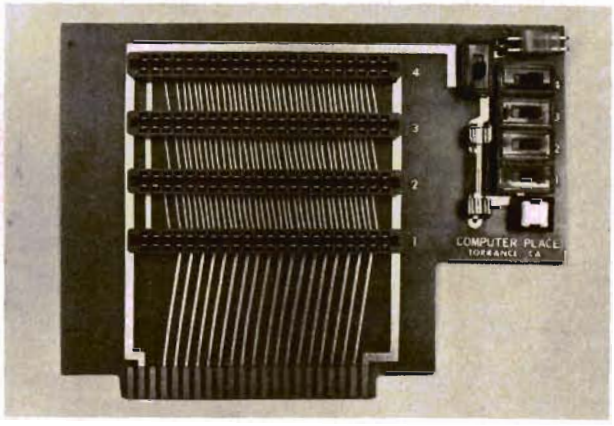

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pyramid computerware

Circle No. 140

Mancala

```
 1 PRINT''[clr]'':PRINTTAB(8)''
   MANCALA'':PRINT

 2 INPUT''PLAYER[sp]ONE'';N1$:
   INPUT''PLAYER[sp]TWO'';N2$

 5 POKE36879,250:F9=0

10 F1=0:F2=0:T=1:S1=0:S2=0:SE=
   0

20 PRINT''[clr][blk]'':PRINTTA
   B(7)''[shf-N][com-Y, 8 time
   s][shf-M]''

30 PRINT''[sp, 2 times]ONE'';T
   AB(7)''[com-G][sp, 8 times]
   [com-M]''

40 PRINT''[pur][right, 2 times
   ]''LEFT$(N1$,4);''[blk]'';T
   AB(7)''[shf-L][com-@, 8 tim
   es][shf-@]''

50 PRINTTAB(7)''[com-G][sp, 3
   times][com-M][sp, 4 times][
   com-M]''

60 PRINTTAB(7)''[shf-L][com-@,
    3 times][shf-@][com-@, 4 t
   imes][shf-@]''

70 PRINTTAB(7)''[com-G][sp, 3
   times][com-M][sp, 4 times][
   com-M]''

80 PRINTTAB(7)''[shf-L][com-@,
    3 times][shf-@][com-@, 4 t
   imes][shf-@]''

90 PRINTTAB(7)''[com-G][sp, 3
   times][com-M][sp, 4 times][
   com-M]''

100 PRINTTAB(7)''[shf-L][com-@,
    3 times][shf-@][com-@, 4 t
   imes][shf-@]''

110 PRINTTAB(7)''[com-G][sp, 3
   times][com-M][sp, 4 times][
   com-M]''

120 PRINTTAB(7)''[shf-L][com-@,
    3 times]
```

```
130 PRINTTAB(7)''[com-
    O][sP, 3 times][co
    m-M][sP, 4 times][
    com-M]''

140 PRINTTAB(7)''[shf-
    L][com-@, 3 times]
    [shf-@][com-@, 4
    times][snf-@]''

150 PRINTTAB(7)''[com-
    O][sP, 3 times][co
    m-M][sP, 4 times][
    com-M]''

160 PRINTTAB(7)''[shf-
    L][com-@, 3 times]
    [shf-@][com-@, 4
    times][shf-@]''

170 PRINTTAB(7)''[com-
    O][sP, 8 times][co
    m-M]''

180 PRINTTAB(7)''[com-
    O][sP, 8 times][co
    m-M][sP]TWO''

190 PRINTTAB(7)''[shf-
    M][com-@, 8 times]
    [shf-N]'';''[pur]
    [sP]'';LEFT$(N2$,
    4);''[blk]''

195 PRINT:PRINT''[shf-
    Z, 8 times][red][r
    vs-on]MANCALA[blk]
    [rvs-off][shf-Z,
    7 times]'';

200 L=7777

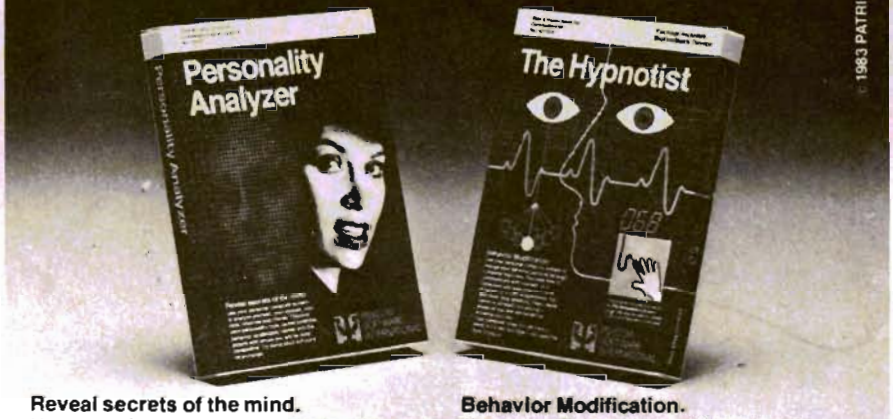
210 FORJ=1TO6

220 POKEL,52:POKEL+307
    20,6:L=L+5:POKEL,5
    2:POKEL+30720,6:L=
    L+39

230 NEXT

240 GOSUB1000:GOSUB200
    0
```


Open your mind



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Reveal secrets of the mind.
Use your Commodore 64 system to analyze yourself, your spouse, your date, relatives and friends. Discover your personality type, career potential, behavior tendencies, values, and the people with whom you will be most compatible. This program requires the use of a "joystick".
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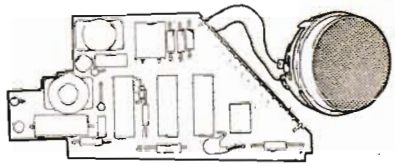
Circle No. 35

THE ULTIMATE LOCATING AND MEASUREMENT SYSTEM



ULTRASONIC "RADAR" DETECTS AND MEASURES PRESENCE AND DISTANCE OF OBJECTS.

This locating system uses a unique electrostatic transducer to generate a short burst of inaudible high frequency sound. The sound travels out from the transducer in a narrow cone and reflects back to the transducer from objects in its path. The same transducer is then used to receive this reflected sound energy and convert it to an electrical signal. The VIC or 64 measures the time between the transmitted pulse and its echo and computes the distance.

SENSITIVITY: Senses objects as small as a flower stem.

RANGE: 10 inches to 35 feet.

RESOLUTION: 1/8 inch below 10 feet.

PROVEN VERSATILITY:

The combination of small size and keen precision has made the non-computer version ideal for such diverse applications as robotics, liquid level measurement, security, aids for the handicapped, electronic tape measure, vehicle back-up sensor and occupational safety. The VIC20/C64 version promises even more.

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Ceiling mounted unit recognizes family members by differences in their height.

TYPE BY POINTING AT AN "INVISIBLE KEYBOARD SUSPENDED IN AIR".

In addition to its already proven uses, the computerized version of this device might possibly be used for invisible joy-stick and game paddles, or perhaps even an invisible no-touch keyboard. A programmer could lie in bed and program his Commodore computer by simply waving his finger in the air, since this device can accurately measure the location of his finger tips to less than two tenths of an inch from 10 feet away.

Ranging module and manual. . . . $99.95

VIC-20/C64 Interface kit & tape. . $99.95

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```
250 DIMA(6,2)
260 FORJ=1TO6
270 FORK=1TO2
280 A(J,K)=4
290 NEXT:NEXT
295 IFT=1THENLO=7778:C
    =12:T1=1
300 IFT=2THENLO=7783:C
    =1:T1=2
305 IFF1=1THENGOSUB300
    0
310 GETA$:GOSUB5000:IF
    A$=""THEN310
320 IFA$=CHR$(133)ANDF
    1<>1THENGOSUB4000
330 IFA$=CHR$(134)ANDF
    1<>1THENGOSUB6000
340 IFA$=CHR$(135)THEN
    GOSUB7000
800 GOTO303
877 ,0:RETURN
999 END
1000 PRINT"[home][down
    , 2 times][pur]"TA
    B(11)S1:PRINT"[ho
    me][down, 17 time
    s]"TAB(11)S2:RETU
    RN
2000 PRINT"[home][down
    , 9 times][sp, 4 t
    imes]"
2002 PRINT"[home][down
    , 11 times][sp, 4
    times]"
2005 PRINT"[blk][home]
    [down, 9 times][r
    ight]"C2
2010 PRINT"[home][down
    , 11 times][right]
    "JJ
2020 RETURN
3000 IFA(C1,T1)=0THENF1
    =0:GOSUB12000:GOTO
    3572
3001 IFA(C1,T1)<C1ANDT=
    2THENF1=0:GOSUB120
    00:GOTO3572
3002 IFA(C1,T1)<7-C1AND
    T=1THENF1=0:GOSUB1
    2000:GOTO3572
3003 A(C1,T1)=0:POKELO,
    32:POKELO-1,32:POK
    ELO-2,32
3005 FORJJ=1TOC2
3010 IFSE=0THENGOSUB130
    00
3020 GETA$:IFA$=""THE
    N3020
3023 'IFA$<>CHR$(134)THE
    N3020
3024 GOSUB10000:GOSUB20
    00
3025 IFT1=1THENC1=C1+1
3026 IFT1=2THENC1=C1-1
3030 IFC1<1THENC1=1:T1=
    1:POKELO,32:LO=LO-
    5:POKELO,102:POKE3
    0720+LO,0:GOTO3050
3035 IFC1>6THENC1=6:T1=
    2:POKELO,32:LO=LO+
    5:POKELO,102:POKE3
    0720+LO,0:GOTO3050
3040 IFT1=1THENPOKELO,3
    2:LO=LO+44:POKELO,
    102
3045 IFT1=2THENPOKELO,3
    2:LO=LO-44:POKELO,
    102
3050 A(C1,T1)=A(C1,T1)+
    1
3055 GOSUB8000
3100 NEXT
```

```
3110 IFA(C1,T1)<=2ANDT=1ANDT1<>1
     THENGOSUB9000

3120 IFA(C1,T1)<=2ANDT=2ANDT1<>2
     THENGOSUB9500

3130 GOSUB1000

3140 POKELO,32

3540 IFT=1THENT=2:GOTO3560

3550 IFT=2THENT=1

3560 F1=0:IFT=2THENLO=7783:C=1:T
     1=2

3570 IFT=1THENLO=7778:C=12:T1=1

3572 C2=0:JJ=0:GOSUB2000

3800 SE=0:RETURN

4000 FF=0:IFT=1ANDC=12THENGOSUB1
     2000:GOTO4040

4010 IFT=2ANDC=6THENGOSUB12000:G
     OTO4040

4020 IFT=1THENPOKELO,32:LO=LO-44
     :C=C+1

4030 IFT=2THENPOKELO,32:LO=LO+44
     :C=C+1

4040 RETURN

5000 POKELO,102:RETURN

6000 FF=0:IFT=1ANDC=7THENGOSUB12
     000:GOTO6040

6010 IFT=2ANDC=1THENGOSUB12000:G
     OTO6040

6020 IFT=1THENPOKELO,32:LO=LO+44
     :C=C-1

6030 IFT=2THENPOKELO,32:LO=LO-44
     :C=C-1

6040 RETURN

7000 F1=1

7010 IFT=1THENC1=13-C

7020 IFT=2THENC1=C
```


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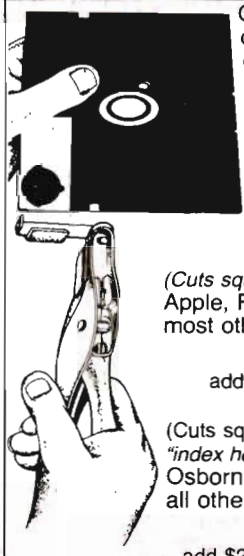

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ALL TRADEMARKS ARE ACKNOWLEDGED

Circle No. 102

MicroBase written by aliens

ARFON DENIES UFO INVOLVEMENT

Lafayette,LA--Officials at Arfon Microelectronics today denied connections between their program MicroBase and recently reported UFO landings in the surrounding Atchafalaya Basin. In a daring midnight raid, Lafayette police apprehended Patrick Doyle, vice-president of the company, and several co-workers, as they tried vainly to escape in their pirogue. The police report alleges that the suspects were seen accepting computer programs, thought to be MicroBase, from a reportedly alien vehicle. Doyle released the following statement on Monday morning:

"I would like to reply to the allegations that our program MicroBase was written by aliens. I will concede that MicroBase is out of this world, with its speed, simplicity, and versatility, but it most certainly is not the product of little green men.

"For the record, let me state that MicroBase was written by a human being like you or me, who was concerned about the lack of quality personal data bases for the VIC 20 and Commodore 64. So he came up with MicroBase, the first data base to run interchangeably on the VIC and 64. MicroBase has all the features of the bigger data bases: user-configurability, sort capability, and seven different search parameters. It allows up to 12 fields per record, up to 80 characters per field, and up to 196 characters per record. And it's memory-resident, so it's faster than disk or tape-resident data bases.

"We can only speculate that the UFO rumors were started because of MicroBase's unearthly price--only $29.95 for tape and $34.95 for disk."

When asked just what he and the Arfon staff were doing in the middle of a swamp at midnight with a Commodore 64 and an undisclosed number of MicroBase programs, Doyle replied, "Cataloging the alligators, of course."

For more information about MicroBase and other Arfon products, call (318) 988-2489 or write Arfon Micro, 111 Rena Drive, Lafayette, LA 70503. Dealer inquiries are welcome.

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Circle No. 38

```
7030 C2=A(C1,T):GOSUB20
     00

7040 RETURN

8000 A1$=STR$(A(C1,T1))

8010 B1$=MID$(A1$,2,1)

8020 IFLEN(A1$)=3THENB2
     $=MID$(A1$,3,1)

8030 IFLEN(A1$)=2THENPO
     KELO-1,ASC(B1$):GO
     TO8050

8040 POKELO-1,ASC(B2$):
     POKELO-2,ASC(B1$)

8050 POKELO-1+30720,6:P
     OKELO-2+30720,6

8060 RETURN

9000 GOSUB11000:GOSUB92
     00

9005 LT=LO

9007 IFC1=6THEN9100

9010 FORXX=C1+1TO6

9015 LO=LO+44

9017 IFA(XX,2)>2THENF9=
     1

9020 IFA(XX,2)<=2ANDF9=
     0THENC1=XX:GOSUB92
     00:GOTO9030

9030 NEXT

9100 F9=0:LO=LT:RETURN

9200 S1=S1+A(C1,T1):A(C
     1,T1)=0:POKELO-1,3
     2:POKELO-2,32

9400 RETURN

9500 GOSUB11000:GOSUB97
     00

9505 LT=LO

9507 IFC1=1THEN9600

9510 FORXX=C1-1TO1STEP-
     1

9515 LO=LO-44

9517 IFA(XX,1)>2THENF9=
     1

9520 IFA(XX,1)<=2ANDF9=
     0THENC1=XX:GOSUB97
     00:GOTO9530

9530 NEXT

9600 F9=0:LO=LT:RETURN

9700 S2=S2+A(C1,T1):A(C
     1,T1)=0:POKELO-1,3
     2:POKELO-2,32

9900 RETURN

10000 POKE36878,6:POKE36
      876,215:FORTJ=1TO5
      0:NEXT:POKE36878,0
      :POKE36876,0

10010 RETURN

10030 POKE36877,0:POKE36
      878,0:RETURN

11000 POKE36878,15:FORL=
      1TO40:POKE36876,IN
      T(RND(1)*128)+128

11010 FORM=1TO10

11020 NEXTM:NEXTL

11030 POKE36876,0:POKE36
      878,0

11040 RETURN

12000 POKE36878,15:POKE3
      6874,150:FORJ=1TO2
      00:NEXT:POKE36878,
      0

12010 POKE36874,0:RETURN

13000 POKE36878,15:FORL=
      1TO2:FORM=200TO220
      +L*2:POKE36876,M:N
      EXTM:NEXTL:POKE368
      78,0

13010 POKE36876,0:SE=1:R
      ETURN
```

Continued from page 54

REPLACES GRADEBOOK

GRADECALC is a menu-driven program that can completely replace classroom attendance sheets and gradebook. Each class is set up on the computer screen in the conventional way that one would set up a gradebook. Then data and scores are entered the same as one would enter them in a grade book. There are provisions for entering scores by percentile, total possible, or by teacher created tables (ex. A=4, B=3 etc.). Particular assignments can be weighted according to their importance. Students may be added or dropped from the class roster at any time.

AVERAGES AT THE TOUCH OF A KEY

After all data is entered the computer will average the grades and present individual and/or class summaries. The summaries are the real value of GRADECALC. At any time during the grading period the computer will average the scores of an individual or an entire class, give a description of each assignment and give a listing of missing assignments. This information may be viewed on the screen or dumped to a printer. Histograms may be printed of individual assignments, particular category average (i.e. homework assignments) or total class average.

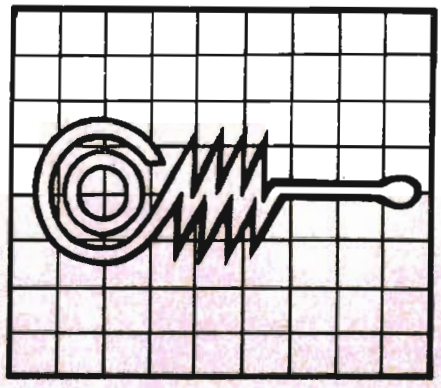
The attendance portion of the program compiles attendance records by date and will display on the screen or dump to the printer the total of days present/absent for an individual or and entire class.

USER FRIENDLY

GRADECALC is very user friendly. There are continual prompts and helps during each phase. Changes and corrections of data can be performed with minimum difficulty. The seventy-four-page manual accompanying the diskette is very thorough in its presentation. The user is guided through each phase step by step with straightforward instructions and numerous illustrations.

TEACHER TIMESAVER

In my opinion, GRADECALC would be an asset to any teacher. For those fortunate enough to have a computer in the classroom, GRADECALC would be a real timesaver and end some of the paperwork drudgery. GRADECALC would be worthwhile even if the data has to be generated at home or duplicated from a conventional gradebook. The advantage of being able to print individual or class progress reports in a matter of minutes at anytime during the grading period would far outweigh the additional time it takes to keep duplicate records. Also having the capability to print a profile of an individual student's scores along with missing assignments would be fantastic at conference time, mid-semester, or after a student had been absent.



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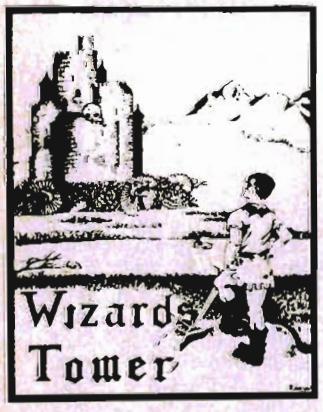

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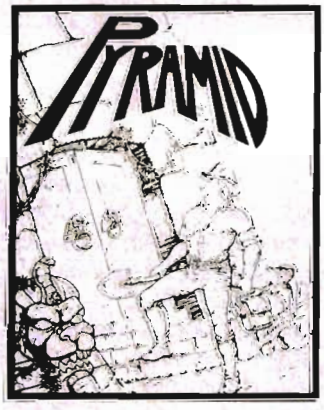

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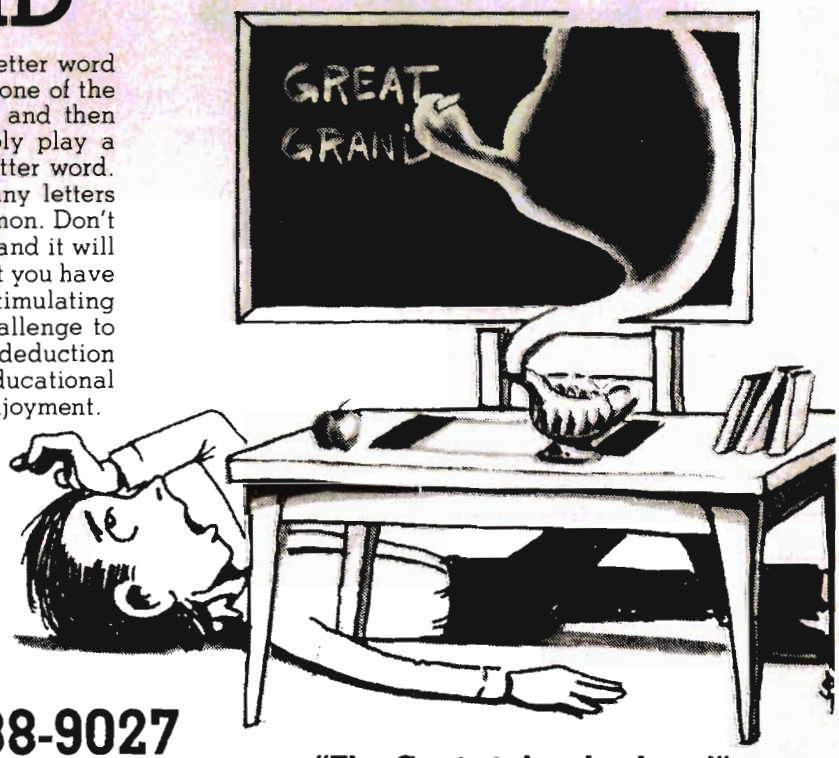

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Circle No. 55

VIC-20 Super Speed Joystick Routine

By Cal Overhulser

You've written a smashing new game program in BASIC but the joystick response is so slow that the game players are twisting the handle off the joystick. How can you speed up the joystick action? With this question in mind I have developed this machine language joystick routine. It can be included within a BASIC program and yields a significant improvement in joystick response. It is driven by the hardware interrupt so once you set it up it is independent of program control.

Three programs are illustrated. Listing 1 is a sample BASIC loader joystick demonstration program including the machine language routine. Listing 2 produces the same results using a typical BASIC joystick routine and is shown here for comparison. Listing 3 is the assembly listing of the machine language routine. Both BASIC programs have been kept simple for demonstration purposes. Both programs leave a trail of purple balls on the screen and when the fire button is pressed, the character changes to the circle graphic character.

The speed comparison of these two programs was impressive. I ran each program and when the ball appeared in the upper left corner, I began timing how long it took to fill the screen. The ball was moved left to right (the screen wraps side to side) until all positions were filled. The program in Listing 2 (BASIC only) took 46 seconds to fill the screen. But when Program 1 was run, it took only 15 seconds–better that three times as fast!

Both BASIC programs will work in any size VIC since they allow for the VIC's relocating screen and color RAM. In Listing 1, the machine language routine is contained in the DATA statements (lines 25-55). Line 20 POKEs the routine into the cassette buffer addresses 828-949. The routine is called in line 65 with SYS 828. This sets up the joystick to be evaluated each time the hardware interrupt occurs. When the hardware interrupt occurs (60 times each second) the joystick condition is returned in address zero and the fire button condition is returned in address one. The BASIC program then PEEKs the joystick and fire button conditions from addresses zero and one.

If you view the joystick positions as points on a compass, then the joystick condition is returned in address zero as follows:

JOYSTICK CONDITION	VALUE IN ZERO
None	0
N	1
NE	2
E	3
SE	4
S	5
SW	6
W	7
NW	8

The fire button condition is returned in address one as follows:

FIRE BUTTON	VALUE IN ONE
ON	16
OFF	0

With the joystick condition represented as shown, the BASIC programming becomes easier and allows line 70 to Peek(0) for all conditions (1-8) and pick the appropriate subroutine. A condition of zero 'falls through' to the next BASIC line. The fire button check in line 85 need only PEEK(1) for a value other than zero.

The routine properly handles all 'housekeeping'; the data direction registers are restored to their original condition before returning to the BASIC program so the keyboard works ok. It was written to be as universal as possible so returns all joystick conditions. If, for instance, your application needs only left and right (E and W) then check only for 3 and 7 instead of the check for 1-8 in line 70. If you do not need the fire button then do not include line 85. To disable the routine, hit RUN/STOP and RESTORE or SYS922. You must disable it before a LOAD or SAVE to avoid a conflict.

You can use the program as written for your 'main loop', incorporating your collision checks in addition to line 75 and your action for the fire button in place of subroutine 900. Or, though the program is a good guideline for most applications, you actually need only include lines 20-55 in your program. The routine can be adapted to most BASIC programs using a joystick when fast response is desired. How much faster your program will run is determined by many factors–delays for sound effects, other objects in motion–but in any case this routine will significantly enhance the joystick response time.

LISTING 1

```
10 REM***MACHINE LANGU
   AGE JOYSTICK DEMO*
   ****

15 REM***          BASI
   C LOADER         *
   *****
```

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```
20 FORX=828TO949:READ
   A:POKEX,A:NEXT

25 DATA120,169,73,141
   ,20,3,169,3,141,21
   ,3,88,96

30 DATA173,19,145,72,
   173,34,145,72,169,
   0,133,0,133,1,169,
   127,141,34,145,173

35 DATA32,145,73,255,
   41,128,42,8,169,19
   5,141,19,145,173,1
   7,145,73,255,41,60

40 DATA74,74,40,42,16
   8,41,16,201,16,208
   ,2,133,1,152,41,15
   ,162,0,232,224

45 DATA9,240,7,221,17
   3,3,208,246,134,0,
   104,141,34,145,104
   ,141,19,145,76,191

50 DATA234,120,169,19
   1,141,20,3,169,234
   ,141,21,3,169,0,13
   3,0,133,1,88,96

55 DATA0,2,3,1,5,4,12
   ,8,10

60 SC=4*(PEEK(36866)A
   ND128)+64*(PEEK(36
   869)AND112):CM=378
   88+4*(PEEK(36866)A
   ND128)-SC

62 CL=SC

65 SYS828:PRINT''[clr
   ]''
70 TL=CL:ONPEEK(0)GOS
   UB100,200,300,400,
   500,600,700,800

75 IFCL>SC+505ORCL<SC
   THENCL=TL:GOTO85

80 POKECL,81:POKECM+C
   L,4

85 IFPEEK(1)THENGOSUB
   900

90 GOTO70

100 CL=CL-22:RETURN

200 CL=CL-21:RETURN

300 CL=CL+1:RETURN

400 CL=CL+23:RETURN

500 CL=CL+22:RETURN

600 CL=CL+21:RETURN

700 CL=CL-1:RETURN

800 CL=CL-23:RETURN

900 POKECL,87:RETURN
```

LISTING 2

```
10 REM***BASIC JOYSTIC
   K DEMO***

15 SC=4*(PEEK(36866)A
   ND128)+64*(PEEK(36
   869)AND112):CM=378
   88+4*(PEEK(36866)A
   ND128)-SC

20 DD=37154:PA=37151:
   PB=37152:CL=SC:PRI
   NT''[clr]''

30 POKEDD,127:PC=PEEK
   (PB)AND128:JR=-(PC
   =0):POKEDD,255
```


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```
35 PC=PEEK(PA):JL=-((PCAND16)=
   0):JU=-((PCAND4)=0):JD=-((P
   CAND8)=0)

40 FB=-((PCAND32)=0):TL=CL

45 IFJUTHENGOSUB100

50 IFJRTHENGOSUB300

55 IFJDTHENGOSUB500
60 IFJLTHENGOSUB700

75 IFCL>SC+5050RCL<SCTHENCL=TL
   :GOTO85

80 POKECL,81:POKECM+CL,4

85 IFFBTHENGOSUB900

90 GOTO30
100 CL=CL-22:RETURN

300 CL=CL+1:RETURN

500 CL=CL+22:RETURN

700 CL=CL-1:RETURN

900 POKECL,87:RETURN
```


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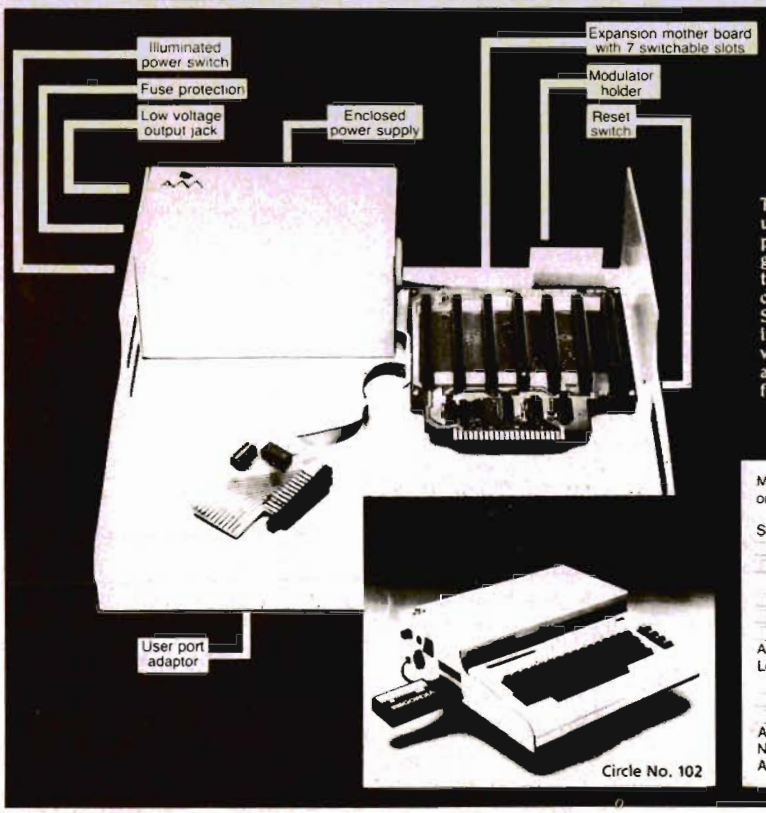

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FILE NAME: JOYSTICK.OBJ

LISTING 3

```
LINE LOC.   CODE      LABEL  OP.  OPERAND        COMMENTS
---- ----   ----      -----  ---  -------        --------

0001 033C              ORG    828
0002 033C              ***************************************
0003 033C              *              VIC 20                 *
0004 033C              *       M.L. JOYSTICK ROUTINE         *
0005 033C              *     DRIVEN BY HARDWARE INTERRUPT    *
0006 033C              ***************************************
0007 033C              *       'SYS828' TO ACTIVATE          *
0008 033C              *      'SYS922' TO DEACTIVATE         *
0009 033C              ***************************************
0010 033C              DDRA   EQU $9113
0011 033C              DDRB   EQU $9122
0012 033C              PORTA  EQU $9111
0013 033C              PORTB  EQU $9120
0014 033C              JOYSTR EQU 0
0015 033C              FIRSTR EQU 1
0016 033C              VECTOR EQU $0314
0017 033C              ***************************************
0018 033C              *       SETUP ROUTINE                 *
0019 033C              ***************************************
0020 033C 78                  SEI             ;LOCKOUT INTERRUPTS WHILE WE SET UP
0021 033D A9 49               LDA #<START     ;GET LOW BYTE OF START ADDRESS
0022 033F 8D 14 03            STA VECTOR      ;PUT IT IN THE VECTOR LOW BYTE
0023 0342 A9 03               LDA #>START     ;GET HIGH BYTE OF START ADDRESS
0024 0344 8D 15 03            STA VECTOR+1    ;PUT IT IN THE VECTOR HIGH BYTE
0025 0347 58                  CLI             ;ALLOW INTERRUPTS AGAIN
0026 0348 60                  RTS             ;GO BACK TO MAIN PROGRAM
0027 0349              ***************************************
0028 0349              *             MAIN ROUTINE            *
0029 0349              ***************************************
0030 0349 AD 13 91     START  LDA DDRA        ;GET INITIAL CONDITION OF DDR
0031 034C 48                  PHA             ;SAVE IT ON STACK
0032 034D AD 22 91            LDA DDRB        ;GET THE OTHER ONE
0033 0350 48                  PHA             ;SAVE IT TOO
0034 0351 A9 00               LDA #0          ;ZERO TO A
0035 0353 85 00               STA JOYSTR      ;CLEAR JOY STORE
0036 0355 85 01               STA FIRSTR      ;CLEAR FIRE BUTTON STORE
0037 0357 A9 7F               LDA #$7F        ;PICK BITS TO CHECK
0038 0359 8D 22 91            STA DDRB        ;SET UP DATA DIRECTION TO CHECK JOY3
0039 035C AD 20 91            LDA PORTB       ;READ JOY3
0040 035F 49 FF               EOR #$FF        ;REVERSE THE BITS
0041 0361 29 80               AND #$80        ;CLEAR 'EM ALL EXCEPT JOY3
0042 0363 2A                  ROL             ;SHIFT JOY3 INTO THE CARRY BIT
0043 0364 08                  PHP             ;SAVE IT ON THE STACK
0044 0365 A9 C3               LDA #$C3        ;PICK BITS TO CHECK FOR REMAINDER
0045 0367              *                      ;OF JOYSTICK AND FIRE BUTTON
0046 0367 8D 13 91            STA DDRA        ;SET UP THE OTHER DATA DIRECTION REG
0047 036A AD 11 91            LDA PORTA       ;READ THE REST OF THE JOYSTICK + F.B.
0048 036D 49 FF               EOR #$FF        ;REVERSE THE BITS
0049 036F 29 3C               AND #$3C        ;PICK OUT OUR BITS
0050 0371 4A                  LSR             ;MOVE 'EM DOWN NEXT TO THE CARRY
0051 0372 4A                  LSR             ;ONE MORE TIME
0052 0373 28                  PLP             ;BRING BACK JOY3 INTO THE CARRY BIT
0053 0374 2A                  ROL             ;SHIFT THEM ALL TOGETHER INTO A
```

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```
0054 0375 AB                TAY         ;SAVE A COPY IN Y
0055 0376 29 10             AND #$10    ;PICK OUT THE FIRE BUTTON
0056 0378 C9 10             CMP #$10    ;IS IT SET?
0057 037A D0 02             BNE JOYCHK  ;IF NOT, DON'T SAVE IT
0058 037C 85 01             STA FIRSTR  ;SAVE IT
0059 037E 98        JOYCHK  TYA         ;BRING BACK THE COPY
0060 037F 29 0F             AND #$0F    ;PICK OUT THE JOYSTICK BITS
0061 0381 A2 00             LDX #0      ;SET UP THE INDEX
0062 0383 E8        LOOP    INX         ;BUMP IT ONCE
0063 0384 E0 09             CPX #9      ;DONE YET?
0064 0386 F0 07             BEQ GETOUT  ;IF SO, GET OUT
0065 0388 DD AD 03          CMP TABLE,X ;CHECK WHICH JOYSTICK POSITION
0066 038B D0 F6             BNE LOOP    ;IF NOT THIS ONE THEN GO BACK
0067 038D 86 00             STX JOYSTR  ;SAVE THE COUNT IN JOYSTICK STOR
0068 038F 68        GETOUT  PLA         ;GET OLD VALUE OF DATA DIRECTION B
0069 0390 8D 22 91          STA DDRB    ;PUT IT BACK
0070 0393 68                PLA         ;GET OLD VALUE OF DATA DIRECTION A
0071 0394 8D 13 91          STA DDRA    ;PUT IT BACK TOO
0072 0397 4C BF EA          JMP $EABF   ;GO DO NORMAL HOUSEKEEPING
0073 039A                   ************************************
0074 039A                   * ROUTINE TO PUT IT ALL BACK       *
0075 039A                   ************************************
0076 039A 78                SEI         ;LOCKOUT INTERRUPTS WHILE WE RESET
0077 039B A9 BF             LDA #$BF    ;NORMAL VECTOR LOW BYTE
0078 039D 8D 14 03          STA VECTOR  ;PUT IT BACK
0079 03A0 A9 EA             LDA #$EA    ;NORMAL VECTOR HIGH BYTE
0080 03A2 8D 15 03          STA VECTOR+1 ;PUT IT BACK TOO
0081 03A5 A9 00             LDA #0      ;ZERO TO A
0082 03A7 85 00             STA JOYSTR  ;CLEAR OUT JOYSTICK STORE
0083 03A9 85 01             STA FIRSTR  ;CLEAR OUT F.B. STORE TOO
0084 03AB 58                CLI         ;LET 'EM INTERRUPT
0085 03AC 60                RTS         ;GIT BACK TO MAIN PROGRAM
0086 03AD 00 02 03  TABLE   BYT 0,2,3,1,5,4,$0C,8,$0A
          01 05 04
          0C 08 0A

0087 03B6                   ************************************
0088 03B6                   *        END OF PROGRAM            *
0089 03B6                   ************************************
ASSEMBLY COMPLETE.

SYMBOL TABLE:

DDRA---$9113   DDRB---$9122   PORTA--$9111   PORTB--$9120   JOYSTR-$00
FIRSTR-$01   VECTOR-$0314   START--$0349   JOYCHK-$037E   LOOP---$0383
GETOUT-$038F   TABLE--$03AD
```

64K for VIC 20
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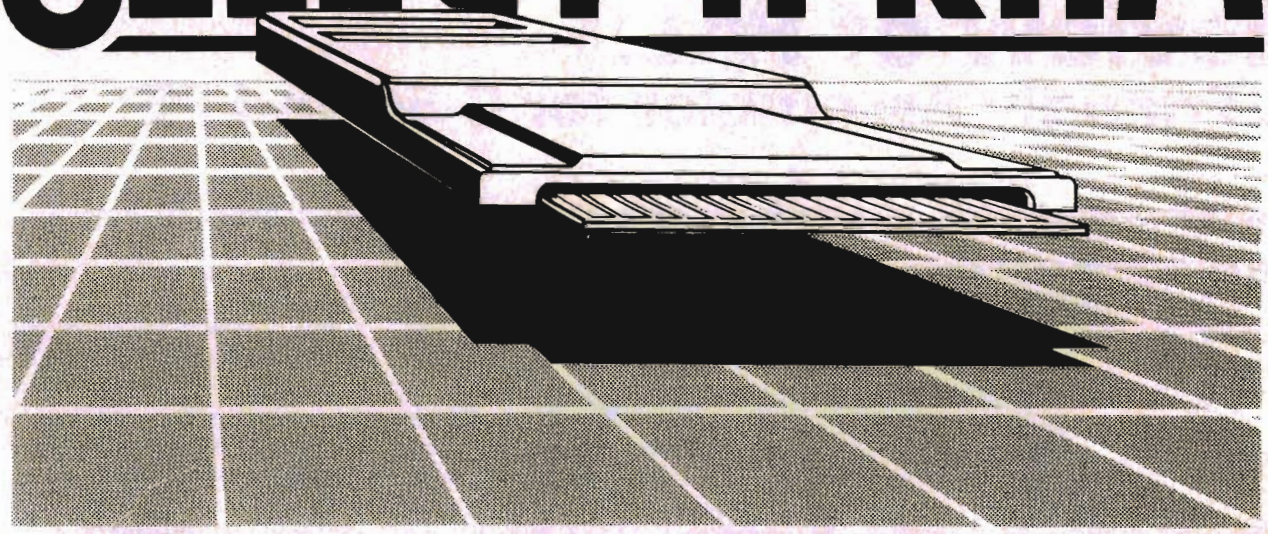

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Review of PAL:
A Friendly Assembler for C-64 and PET

By David A. Hook

TITLE:	***PAL64 and PAL***
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LANGUAGE:	6502 machine language
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SOURCE:	Pro-Line Software Ltd. 755 The Queensway East, Unit 8 Mississauga, Ontario, Canada L4Y 4C5 (416) 273-6350
RATING:	Excellent
PERFORMANCE:	First class

DESCRIPTION

PAL stands for Personal Assembly Language and was written by Brad Templeton. Mr. Templeton is the author of the popular POWER and POWER64 enhanced editors for both PET/CBM and Commodore 64. These packages are available from Professional Software Inc.™, NEEDHAM, MA.

The program is approximately 4K in size and is provided on diskette, with several related programs and utilities for the assembly language programmer. It may be relocated to an EPROM chip, thus fitting in one of the two empty sockets within the PET/CBM.

FEATURES

When you write source code for an assembler, you are often faced with learning an entirely new set of commands for the "editor" provided with it. PAL uses the built-in BASIC screen editor, and all the familiar features that you are already well-acquainted with. Better the devil you know, right. . . .?

Of course, the side benefit is that you can use common utilities to enhance the process: renumber, search and replace, block delete and the like. Mr. Templeton would be happy if you were to purchase the appropriate POWER utility, but the public-domain versions of BASIC-Aid work quite well too. Therefore, the task of text entry and modification is considerably simplified.

When the source code has been written, it would be useful to save a copy or two and be able to recover it at a later date. Once again, there is no hocus-pocus sequence of unfamiliar commands–just SAVE and LOAD as the normal BASIC program structure would suggest.

When you are composing the source text, there are several features that simplify things. First, there is no need to follow strict rules for identifying labels, opcodes, operands and remarks. The text is typed in "free-format", with spaces separating the various fields. PAL will identify if there is a label present, without the need for special spacing. Second, several instructions can be written on the same "line" of text: the colon acts as a multiple-statement delimiter, as in BASIC. When assembled, the listing properly aligns the six fields neatly, and prints the BASIC line numbers you used (should you need to locate the line in your source code later.)

The assembly process is activated by a 'SYS' call from within BASIC. This enables mixing of BASIC with assembler source code. The C-64 version has a command that makes "composite" BASIC/assembler programs a snap–parameters from BASIC are recognized in the assembler part. This means the requisite 'SYS' values in BASIC get calculated and put into the BASIC part automatically.

Large programs are assembled using the linking properties of the '.FIL' directive. I have personally seen programs of up to 25K worth of machine code being assembled with PAL. It's hardly likely that I'll write anything that big, but it sure is comforting to see PAL's capacity to do it.

For most programs, the flexibility of PAL is truly an advantage. You can assemble programs of moderate size (1K size is cited) directly into memory, without needing to store them or the object code first. This is extremely handy for debugging, and virtually eliminates the multi-step process (save the source, load the assembler module, assemble, execute, find a bug, reload the editor, reload the source, correct the source code, save the source again. . .)

For larger programs or those which would conflict with the memory locations in use, the object code may be written directly to a disk file. When stored, the code becomes a program file, with the appropriate load address being written first. Thus the object code becomes a "ready-to-go" machine language program. There's no need to SAVE the proper addresses yourself with the MLM monitor. This is a major convenience.

The assembler output may be printed directly to the screen or to any file OPENed in the preliminary BASIC listing. Printers and disk files would be the major outlets for this output.

The speed of the assembler is quite remarkable–faster than any assembler I've used. The author cites a 5-to-1 factor in the time for assembly of a 1K program versus the Commodore assembler. With a 4K program, I found a two minute assembly time for PAL as compared to an eleven minute assembly time for MAE, using

comparably-prepared text files. This is no small factor in even moderate-sized jobs.

Another major strength of PAL is its "expression evaluator". You may combine arithmetic operators and parentheses to provide complex expressions to be evaluated. Many assemblers permit only addition. (I'm still trying to find a way to specify the low or high part of an address with a MAE jump table.) Twelve mathematical operators, including Boolean and bit-shifting ones, are available. Nested parentheses and brackets alter the left-to-right order of operation.

Conditional assembly is supported, using the pseudo-op '.IFE'. This is a simple true/false comparison. However, when the power of the expression evaluator is considered, more complex conditional relations are possible.

One novel feature of PAL is the capacity to store and load a symbol table as a separate entity. Thus, once you have prepared a table of the labels for important PET/C-64 memory locations and ROM routines, there will be no need to redefine them for every source program. Simply call for a reload of the symbol table and use the names you have come to love. Combined with the conditional assembly feature, this simplifies the process of keeping a single source file for several ROM versions.

The power and convenience of an assembler is closely tied to the number of pseudo-ops it contains. While every assembler can handle the task of generating legitimate object code, an assembler without pseudo-ops is virtually unusable. PAL adheres closely to the MOS 6502 standard for the most part. You can specify strings of single bytes, address tables and strings of ASCII text characters, reserve blocks of memory, define or adjust the program counter readily and handle all the other fundamental activities. A total of sixteen (seventeen for C-64) of these directives are built-in. For printing of the assembly listing and generating the object code, a total of seven options are available.

Error messages total twenty-three, and are not just a cryptic code number. They can be detected on both passes of the process, and the fatal ones cooperate by stuffing a BRK op-code where it aborts. (This *may* save a crash in the event you've missed or ignored the error.)

DOCUMENTATION

The manual is typeset, 41 pages long, in a 3-ring binder. There are a few typos, mostly insignificant. The information is very thorough and includes a comprehensive reference to the inner workings of the PAL assembler. Documentation of the internal routine vectors will permit devoted hackers to get inside PAL and add their own pseudo-ops or other routines. Owners of POWER will recognize the similarity to the "author's notes" appendix in that package.

There are references to the syntax of other 6502 assemblers, with fairly detailed hints on interconversion of source files to and from the other formats. This is especially helpful in modifying source text to be compatible with PAL.

There are several versions of PAL included on the disk. You can get a 'RUN' version which relocates itself automatically into high memory, adjusting the appropriate pointers accordingly. There is a version which can produce "relocatable" object code, useful in conjunction with one of two "loader" programs, also provided.

OTHER COMMENTS

There is no macro capability. Macros are shorthand definitions where a single reference can generate several machine language instructions. While macros are useful for doing repetitive tasks involving related, but not identical references, I never used them with the MAE assembler anyway.

The assembler does not recognize a "phase error", where the program counter gets mixed up from Pass 1 to Pass

Continued on page 26

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Cyrillic Screen Letters for the VIC-20

By Thom Robertson

For nearly a year now I have been using my VIC-20 personal computer to play my friends' adventures and to make my own. One thing that I always looked at with discomfort (literally) was the screen.

Simply put, I just could not get the feeling of slaying mighty dragons while looking at the VIC's blocky characters. Of course, I have seen games that use great graphics and sound to enhance play, but I and my friends just did not have the memory to add these routines to a standard text adventure.

Recently, a friend bought an adventure that utilized an interesting concept: a customized character set arranged to simulate Old English script. I was quite pleased with the results, and resolved to create a cyrillic set (as it is called) for myself.

At this point, I must digress, as the process I will describe is based on information provided in the VIC-20 Programmer's Reference Manual. Some readers will not have the pleasure of owning this particular tome, but I urge them to buy it soon. For those who have it and know how to use custom character sets, well, you'll know what I'm talking about.

HOW CHARACTERS ARE DISPLAYED

On the VIC's screen, every character is represented as an 8 × 8 grid of dots, each of which can be on or off. Since a computer regards a number as a set of eight bits which can be on or off, it is quite natural to save memory by making each row of a character's grid be represented by one number. Thus, a set of eight numbers can be used to make any character you want.

Each character (represented by eight numbers) is stored in ROM (Read Only Memory), and thus is impossible to change. It is, however, possible to change a pointer's pointing to the beginning of the character set memory. This pointer is located at 36869, and when it is set to 240, the computer gets its characters from ROM. When the pointer is set at 255, VIC gets its set from the top of user RAM (Random Access Memory), just below the screen. Putting the correct numbers in the correct sequence in this area in memory can result in any character set a programmer could want.

CUSTOM CHARACTER PROGRAM

This is, basically, what my program does.

Let us now proceed into a step-by-step analysis of this program.

Line 8 begins the program by "cordoning off" the memory used by the character set. This prohibits the computer from accidentally putting basic code there.

Line 9 sets the variable CN to the number of characters that are ready in the DATA statement.

Lines 10-9998. If you are going to incorporate my program in one of yours, put all of your program lines between these two REM (Remark) statements. You can erase Line 30, as it is useless in this situation.

Line 9999 ENDs the program before it illegally reach the character set maker.

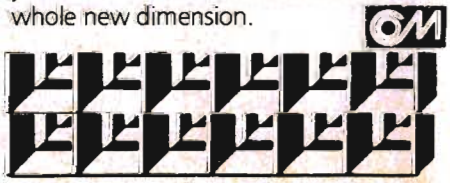
Line 10010 begins the set making process by putting, in RAM, a character set identical to the one in ROM. This is done to replace any characters not provided for in the DATA statements.

Line 10020 does several things. First, it goes into a loop which POKEs the character set from DATA statements into memory. Then, it changes the pointer (36869, remember?) so the VIC will read the newly-made RAM character set. Finally, it RETURNS control to the main program.

Lines 10100-10360 are the DATA statements. Every statement has eight numbers after it, and thus stands for one character.

One of the eccentricities of this program is the cursor. When the character set is in operation, the cursor does not blink. In fact, it is totally invisible. Make sure users know this, or they will think a system crash has occurred. Also, the program cannot be used with lowercase letters. Reversed or graphics characters will not work either.

In spite of these limitations, this program is very versatile. It can be used as is, incorporating it into your program. Or, to save memory, this program can be run first, then your program can be loaded over it and run. Since the character set is already in untouchable memory, even typing NEW will not erase the cyrillic set. To do this, however, requires that you replace Line 9999 with 9999 LOAD. Then you must load this program before your own on tape. After that, just LOAD and RUN this program and let it do the rest. Then your medieval adventures can take on a whole new dimension.



VIC-20 CYRILLIC SCREEN CHARACTERS

```
   8 POKE52,28:POKE56,
     28:CLR

   9 CN=26:GOSUB10000

  10 REM**************
     **

  30 REM* PROGRAM HERE
      *

9998 REM**************

9999 END

10000 REM,

10010 FORI=7168TO7679:P
      OKEI,PEEK(I+25600
      ):NEXTI

10020 FORI=7176TO7176+8
      *CN-1:READB:POKEI
      ,B:NEXTI:POKE3686
      9,255:RETURN

10100 REM CHAR. DATA  H
      ERE

10110 DATA120,164,36,60
      ,36,164,66,0

10120 DATA124,162,34,60
      ,34,162,124,0

10130 DATA24,38,68,64,6
      4,36,24,0

10140 DATA124,162,34,34
      ,34,162,124,0

10150 DATA124,162,32,56
      ,32,162,124,0

10160 DATA124,162,32,56
      ,32,160,64,0

10170 DATA26,36,64,76,6
      8,36,24,0

10180 DATA98,164,36,60,
      36,164,98,0

10190 DATA56,84,16,16,1
      6,84,56,0

10200 DATA60,74,8,8,232
      ,72,48,0

10210 DATA98,162,36,40,
      56,164,98,0

10220 DATA96,160,32,32,
      34,162,124,0

10230 DATA84,170,42,42,
      42,162,68,0

10240 DATA88,164,36,36,
      36,164,66,0

10250 DATA48,72,132,132
      ,132,72,48,0

10260 DATA124,162,34,60
      ,32,160,64,0

10270 DATA48,72,132,132
      ,148,72,52,0

10280 DATA124,62,34,60,
      40,164,98,0

10290 DATA126,130,128,1
      24,2,130,252,0

10300 DATA124,146,16,16
      ,16,16,56,0

10310 DATA72,164,36,36,
      36,36,26,0

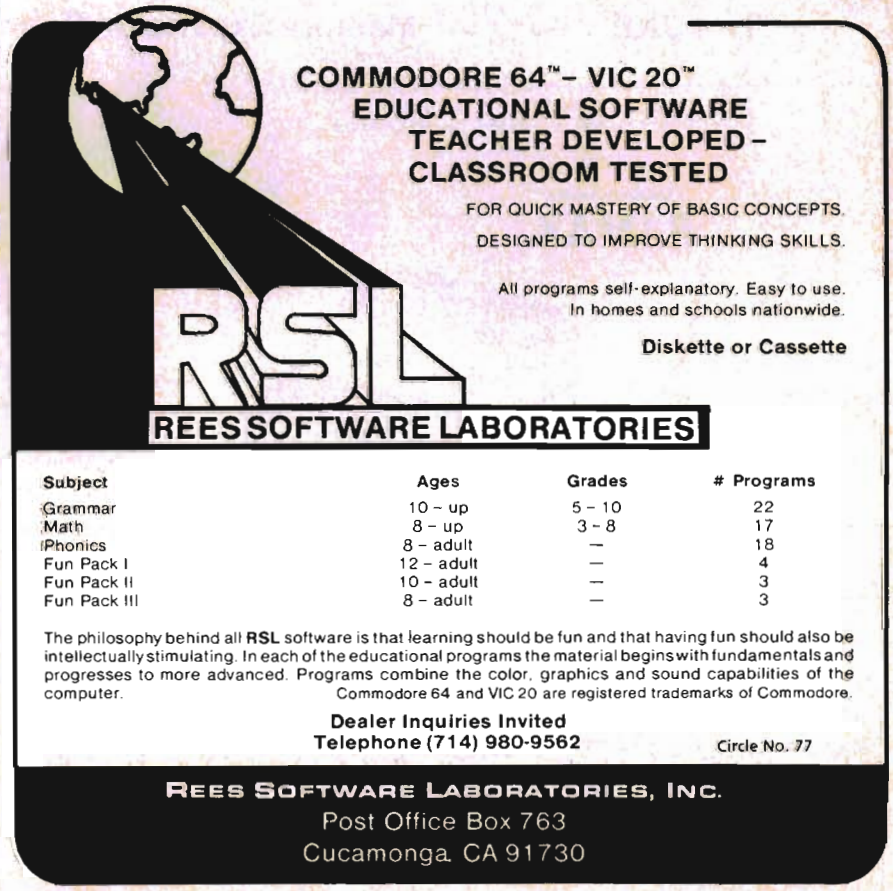
10320 DATA68,162,34,34,
      20,20,8,0

10330 DATA68,162,34,42,
      42,42,20,0

10340 DATA66,164,24,24,
      36,66,132,0

10350 DATA68,162,20,8,8
      ,40,16,0

10360 DATA126,132,8,16,
      32,66,252,0
```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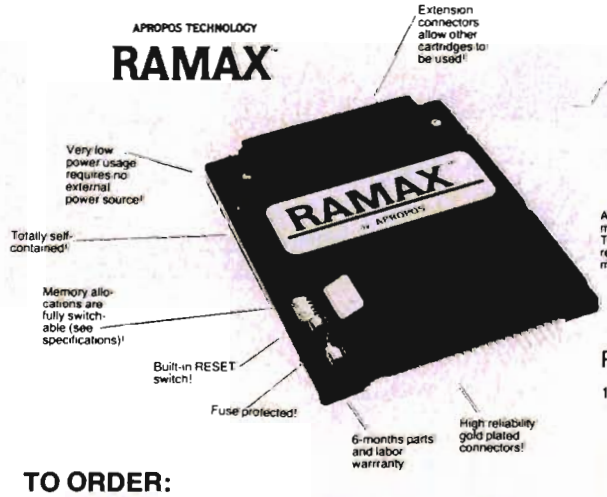
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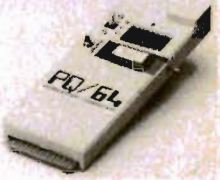

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Gymnasium of the Future

By Nancy Iscaro

With 200-300 students in a class, the gym teacher willing to hold competitions must do an incredible amount of statistics gathering and calculations. Because many teachers cannot justify the record keeping time, they choose not to hold competitions. They work with their students instead of spending massive time equating scores, summing categories, averaging and looking up records.

Hector Martinez coordinates the gym program at West Side High School in New York City. Hector believes that competitions and leagues are essential to the athletic growth in the gym curriculum. He came to the Computer Science department for help and was introduced to an easy-to-use, microcomputer-based data manager.

Power lifting is just one of the competitions held at West Side High School. It is a test of strength and endurance. There are seven categories in the powerlifting competition including sit ups, lifting weights. . . and most of the exercises you see in ROCKY III.

Men and women, boys and girls in elementary school through college enter powerlifting competions (when they are available in the curriculum). There is a direct relationship between weight and strength. All but one of the categories in power lifting must be equated by weight to find the student with the greatest relative strength.

The math involves six weight subtractions and summing of seven categories for each contestant. Once this is done an average is needed for each category for intra-school prizes. Finally a ranking is done for interschool awards.

The math is repetitive and easy–but it is BORING, TEDIOUS, & TIME CONSUMING. Calculating results can take weeks by hand. This is a perfect application for a computer with the proper software for keeping records. MINI JINI Record Keeper does not get bored and can do repetitive math for all students at the same time in a matter of minutes.

COMPUTER POWER LIFTING COMPETITION

Here is the system Hector needed to calculate the results of West Side High School's Power Lifting Competion.

Hardware . . . . . VIC-20 or C-64 with tape player or disk and TV

Software . . . . . MINI JINI Record Keeper

Computer Ability Required . . . . Beginner

Procedure:

1. Plug MINI JINI cartridge into the VIC-20 or C-64
2. Turn the power on.
3. Type *c* to create a file
4. Type *y* if you are sure
5. Type *10* for 7 contest categories + name, weight, math

As MINI JINI directs, type the following categories:

1 NAME/RECORDS (Last name then first plus non-math items)
2 BENCH PRESS
3 TRI-ENTENSIONS
4 ARM CURLS
5 FRONT PRESS
6 LEG CURL–M/EXT–F
7 LEG PRESS
8 CURL UPS
9 WEIGHT
10 SCORE

To gather student information, type *a* and add each Contestant's data. Once the information is entered, each category is equated by subtracting the student's weight from each category (except curl-ups).

Always start options in the MAIN MENU. Use math option 4 to subtract the weight in field from the categories in fields 2 thru 7.

Main Menu Option	Math Option	Field#1	Field#2	Answer Field#
M	4	2	9	2
M	4	3	9	3
M	4	4	9	4
M	4	5	9	5
M	4	6	9	6
M	4	7	9	7

To find the total individual score add all the equated scores in the categories listed in fields 2 through 8. Use math option 2 to add two fields. MINI JINI Record Keeper adds two fields at one time. Use field 10 (MATH) to hold the results as fields are added together.

Main Menu Option	Math Option	Field#1	Field#2	Answer Field#
M	2	2	3	10
M	2	10	4	10
M	2	10	5	10
M	2	10	6	10
M	2	10	7	10
M	2	10	8	10

Finally, to see the class or school average for each event, sum and average each contest category in fields 2 through 8. Use math option 9 to sum and average.

Main Menu Option	Math Option	Field#1
M	9	3
M	9	4
M	9	5
M	9	6
M	9	7
M	9	8

The gym department does not have a printer, so Hector uses the printer in the Computer Science department. He prints two reports.

GENERAL REPORT

The first report is a general information listing. It can be posted for all to see or filed along with the Ranking Report below. Use the order option to alphabetize this report by name. Include everything except weight. Some students are sensitive about their weight and it is only needed to equate relative strength.

Main Menu Option	Field#1
Ø	1

When the MAIN MENU appears, the file fo contestants is ordered by name and is ready to be printed with the print option. Use all fields except weight, field 9.

Main Menu	Print	F#1	F#2	F#3	F#4	F#5	F#6	F#7	F#8
M	R	1	2	3	4	5	6	7	8
								F#9	F#10
								109	

RANKING STUDENTS

The second report consists of names and final scores (fields 1 and 10). To be ranked the file is first ordered by the final scores. Before ordering press *1* to *Look thru*. Check all scores for length. Make all numbers the same length; for example, with scores like 95 (two numbers) and 125 (three numbers) change 95 to Ø95. Press *c* to *Change* the record on the screen. Type *1Ø*. Now use the order option to rank the list.

Main Menu Option	Field#1
Ø	1Ø

When the MAIN MENU appears, the file of contestants is ordered by score and ready to be printed. Use only the two fields required. Use the print option to print a report.

Main Menu	Print	F#1	F#2	F#3	F#4	F#5	F#6	F#7
M	R	1	10					
						F#8	F#9	F#10

SUMMING UP

Hector Martinez has taken the long leap into the 1980's. He lets a computer do most of the tedious mathematical work. The actual math for the power lifting competition took less that 7 minutes--not the two weeks Hector had dreaded. He was able to spend time with his students, friends and family instead of the calculating. Preparing and printing reports took only one period. The time saved was incalculable.

Hector has a permanent record of this year's power lifting competition results. He can easily *Look thru* the file, quickly *Search* for competition records, restore the original scores using *Mathpack*, and *Print* other reports. The experience is enlightening and use of computers in the West Side High School's gym curriculum is to be expanded.

VIC-20

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Written by a college professor in a friendly and informative style, the Blue Book gives you theory of operation, schematics, program listings, parts list, construction hints and sources of materials for each one of the 30 projects.

If you want to get the most out of your VIC this book is a must. Even if you don't plan to build any of the projects, the Blue Book is a valuable source of information on what can be done with the VIC.

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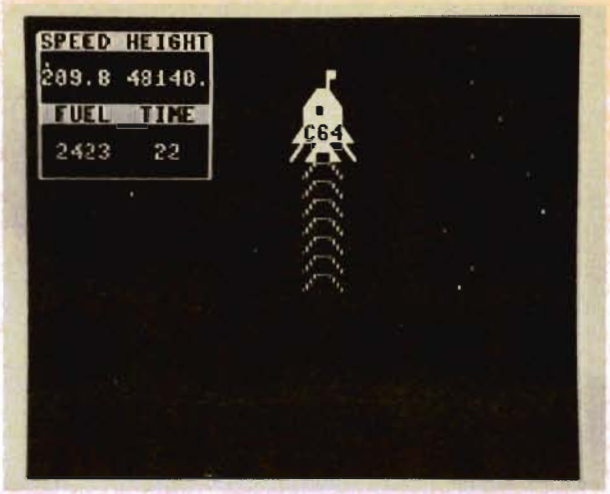

Lunar 64

A C-64 Game Reincarnated from the PET

By Howard Rotenberg

Did life (or at least computer games) exist before the VIC and the C-64? Let's face it, we all look forward to playing our favorite games on the old computer when the day is over. Some of you may not know that PET users in days of yore had quite a collection of game programs, well before the newest generation of Commodore computers were conceived. For example, I have more than a thousand PET games in my personal file. Most of these are public domain games contributed by the few users who were active in those early years. Many of these games, although lacking color and fancy sound effects, are at least as challenging and fun to play as a lot of the newer ones. In fact, quite a few of the current games have their conceptual origins in those old standbys.

My intention is to resurrect the best of the public domain PET games in a form that is suitable for the C-64. This time I present LUNAR 64, a revamped version of the old LUNAR LANDER. I have attempted to keep the program functionally the same as the original, except for the addition of appropriate sound and color. The game simulates the landing of a spaceship on the moon. You must control the rate of deceleration, as indicated in the numeric display, to achieve a soft landing before running out of fuel. More detailed instructions are presented in the program. Happy landings!

```
10 REM
20 REM ************************
30 REM *       LUNAR 64       *
40 REM *   MODIFIED FOR THE   *
50 REM *     COMMODORE-64     *
60 REM * BY HOWARD ROTENBERG *
70 REM ************************
80 REM
```

```
 90 POKE53281,0

100 FOR AA=1TO24 :POKE
     54272+AA,0:NEXT

110 PRINT''[clr][wht]''


120 GOTO660

130 I4=I5

140 GOSUB880

150 PRINT''[down]''

160 TH=0:T=0

170 X0=52800

180 V0=-176:F=1:S=1

190 GOSUB440

200 GOSUB1090

210 AT=TI:AG=TI

220 GETRR$:IFRR$<>''''
    THENR=VAL(RR$)

230 IF(TI-AT)>30THENAT
    =TI:GOTO250

240 GOTO230

250 T=T+R

260 TH=TH+1

270 A=5.4*(1-0.2*R)

280 X=V0+0.5*A:X0=X0+X

290 IFX0>0THEN310

300 X=X-X0:F=0:X0=0

310 D=V0*V0-2*X*A

320 IFD>0THEN340

330 D=-D:S=-1

340 V0=SQR(D)*S*SGN(X)

350 S=1

360 IFV0>0THENPRINT''[
    rvs-on]'';

370 PRINT''[home][down
    , 3 times][right]''
    ;MID$(STR$(V0),2,5
    )''[rvs-off]'';

380 PRINTLEFT$(STR$(X0
    )+A$(0),7)

390 PRINT''[down, 2 ti
    mes]''
```

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```
400 PRINT''[right]'';2
    500-T''[left][sp,
    3 times][left, 2 t
    imes]''TAB(8);TH

410 GOSUB620:IFF=0THEN
    GOSUB930:GOTO980

420 IFT>2500THENR=0:GO
    TO260

430 GOTO220


440 A$=''[down][left,
    5 times]''

450 A$(0)=''[sp, 6 tim
    es]''

460 A$(1)=''[com-8][sp
    ][com-M][com-V][sp
    ]''

470 A$(2)=''[com-8][sp
    ][rvs-on][shf-£][c
    om-*][rvs-off][sp]
    ''

480 A$(3)=''[com-8][sp
    ][rvs-on][sp][com-
    V][sp][rvs-off][sp
    ]''

490 A$(4)=''[com-8][rv
    s-on][shf-£]C64[co
    m-*][rvs-off]''

500 A$(5)=''[com-8][sh
    f-N][rvs-on][shf-£
    ][com-I][com-*][rv
    s-off][shf-M]''

510 A$(6)=A$(0)

520 PRINT''[home][down
    , 2 times]''TAB(19
    );

530 FORI=0TO6

540 PRINTA$(I)+A$;

550 NEXT

560 PRINT''[yel][home]
    [sp][com-@, 12 ti
    mes]''

570 PRINT''[yel][com-M
    ][rvs-on]SPEED[sp]
    HEIGHT[rvs-off][c
    om-G]'':GOSUB600

580 PRINT''[yel][com-M
    ][rvs-on][sp]FUEL[
    sp, 2 times]TIME[s
    p][rvs-off][com-G]
    '':GOSUB600


590 RETURN

600 FORI=1TO2:PRINT''[
    yel][com-M]''TAB(1
    3)''[yel][com-G]''
    :NEXT

610 PRINT''[yel][com-M
    ][com-@, 12 times]
    [com-G]'':RETURN

620 PRINTTAB(19);:IFR=
    0THENRETURN

630 FORI=1TOR:PRINT''[
    blu][sp][shf-N][co
    m-Y][shf-M][down][
    left, 4 times]'';:
    NEXT:FORI=RTO10:PR
    INT''[sp, 4 times]
    [down][left, 4 ti
    mes]'';

640 GOSUB1150:NEXT

650 PRINT''[up, 11 tim
    es]'';:FORI=1TO10:
    PRINT''[sp, 4 time
    s][down][left, 4 t
    imes]'';:NEXT:PRIN
    T''[yel]'':  RETUR
    N

660 PRINT''THIS[sp]GAM
    E[sp]SIMULATES[sp]
    THE[sp]LANDING[sp
    ]OF[sp]A''

670 PRINT''SPACECRAFT[
    sp]ABOVE[sp]THE[sp
    ]LUNAR[sp]SURFACE.
    '':PRINT

680 PRINT''READINGS[sp
    ]ON[sp]THE[sp]GAUG
    ES[sp]ARE:''

690 PRINT''[sp, 4 time
    s]VELOCITY[sp, 8 t
    imes]IN[sp]FT/SEC'

700 PRINT''[sp, 4 time
    s]HEIGHT[sp, 10 ti
    mes]IN[sp]FEET''


710 PRINT''[sp, 4 time
    s]REMAINING[sp]FUE
    L''

720 PRINT''[sp, 4 time
    s]ELAPSED[sp]TIME[
    sp, 4 times]IN[sp]
    SECONDS'':PRINT

730 PRINT''IF[sp]THE[s
    p]VELOCITY[sp]SHOU
    LD[sp]APPEAR[sp]IN
    ''

740 PRINT''REVERSE[sp]
    FIELD[sp](EG.,[rv
    s-on]256[rvs-off])
    ,YOU[sp]ARE[sp]GOI
    NG''

750 PRINT''UP.[sp, 2 t
    imes]THE[sp]CONTRO
    LS[sp]ARE[sp]THE[s
    p]NUMBER[sp]KEYS.'

760 PRINT''THE[sp]HIGH
    ER[sp]THE[sp]NUMBE
    R,THE[sp]HARDER[sp
    ]YOU''

770 PRINT''THRUST.[sp,
     2 times]A[sp]THRU
    ST[sp]OF[sp]5[sp]W
    ILL[sp]EXACTLY''

780 PRINT''BALANCE[sp]
    GRAVITY,[sp]ALLOW
    ING[sp]YOU[sp]TO[s
    p]FALL''

790 PRINT''AT[sp]A[sp]
    CONSTANT[sp]RATE.
    [sp, 2 times]THE[s
    p]OBJECT[sp]IS[sp]
    TO''

800 PRINT''LAND[sp]AT[
    sp]A[sp]SPEED[sp]O
    F[sp]LESS[sp]THAN[
    sp]15[sp]FT/SEC.''
    :PRINT
```

```
810 PRINT''YOU[sp]STAR
    T[sp]AT[sp]52800[s
    p]FEET,[sp]FALLING
    [sp]AT[sp]A''

820 PRINT''RATE[sp]OF[
    sp]176[sp]FT/SEC,[
    sp]WITH[sp]2500[sp
    ]UNITS''

830 PRINT''OF[sp]FUEL.
    [sp, 2 times]IF[sp
    ]YOU[sp]RUN[sp]OUT
    [sp]OF[sp]FUEL,[sp
    ]YOU''

840 PRINT''WILL[sp]FAL
    L[sp]LIKE[sp]A[sp]
    ROCK!'':PRINT

850 PRINT''DO[sp]YOU[s
    p]UNDERSTAND'';:IN
    PUTU$

860 IFLEFT$(U$,1)=''Y''
    THEN130

870 PRINT''[clr]PLEASE
    [sp]RE-READ[sp]CAR
    EFULLY!'':GOTO660

880 PRINT''[clr]''

890 FORI1=1TO14

900 PRINTTAB(39*RND(1)
    );''.''

910 NEXTI1

920 RETURN

930 H=4.5:H$(1)=''[com
    -@]'':H$(2)=''[com
    -P]'':H$(3)=''[com
    -O]'':H$(4)=''[com
    -I]'':H$(5)=''[rvs
    -on][com-U][rvs-of
    f]'':H$(6)=''[rvs-
    on][rvs-off]''

940 H$(7)=''[rvs-on][c
    om-Y][rvs-off]'':H
    $(8)=''[rvs-on][sP
    ][rvs-off]''

950 PRINT''[home][down
    , 17 times]'':FORI
    =1TO40

960 N=INT(RND(1)*7)+1:
    IFABS(N-H)>2THEN96
    0

970 H=N:PRINTH$(H);:NE
    XTI:RETURN

980 PRINT''[home][down
    , 3 times]''SPC(19
    );

990 XX=255:FORI=1TO10:
    FORJ=0TO5:PRINTA$(
    J)+H$;:NEXT:PRINT''
    [up, 5 times]'';

1000 GOSUB1190:XX=XX-25
     :NEXT

1010 IFV0<-15THEN1030

1020 PRINT:PRINT''[down
     , 6 times]CONGRATU
     LATIONS,[sp]YOU[sp
     ]LANDED[sp]SAFELY!
     !'':GOTO1060

1030 PRINT''[sp, 4 time
     s][down][left, 4 t
     imes][sp, 4 times]
     [down][left, 4 ti
     mes][sp, 4 times][
     down][left, 6 time
     s][sp, 3 times][ri
     ght, 3 times][rvs-
     on][com-*][right][
     sp][down][left, 10
      times][rvs-off][c
     om-*][rvs-on][sp][
     rvs-off][com-*][ri
     ght, 3 times][com-
     Z][sp][rvs-on][sp]
     [rvs-off][shf-£][
     shf-P]''

1040 PRINT''[down, 2 ti
     mes]''

1050 POKE55+24,15:POKES
     S+1,15:POKE55+4,12
     8:FORJ=1TO1500:NEX
     T

1060 FORJ=1TO24:POKE55+
     J,0:NEXT:INPUT''DO
     [sp]YOU[sp]WANT[sp
     ]TO[sp]TRY[sp]AGAI
     N'';G$
```


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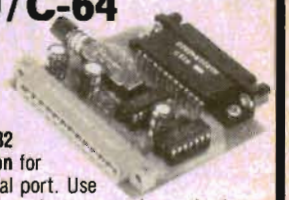

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Circle No. 183


```
1070 IFLEFT$(G$,1)="Y"
     THENCLR:RUN

1080 POKE53281,6:PRINT"
     [com-7]":END

1090 PRINT"[home][down
     , 18 times]"

1100 A=TI

1110 PRINT"MOON[sp]LAN
     DER[sp]GAME[sp]STA
     RTS[sp]IN"5-INT((
     TI-A)/60)"[left][
     sp]SECONDS[sp, 5 t
     imes][up, 2 times]
     "

1120 IF(TI-A)<300THEN11
     10

1130 PRINT"[sp, 38 tim
     es]":R=0

1140 RETURN

1150 SS=54272:POKE SS+2
     4,15:POKESS+6,240:
     POKESS+4,17

1160 POKE SS+1,J

1170 POKE SS+4,32

1180 RETURN

1190 POKESS+24,7:POKESS
     +5,12*16+0:POKESS+
     6,15*16+10

1200 POKESS+1,XX:POKESS
     +4,17:RETURN
```

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News Releases

FIRST LOGO INFORMATION EXCHANGE GOES ON-LINE

Richardson, Texas–The Young Peoples' Logo Association has introduced their newest member service, The Midnight Turtle, the first Logo Information Exchange. It features electronic mail, chatting, up and downloading of Logo software, and five bulletin boards. The system is currently in operation twelve hours per day, 7:00 PM to 7:00 AP CST. The access number is (214) 783-7548.

The Midnight Turtle is an easy-to-use electronic news system offering five bulletin boards, one for each of the association's major interests: a public access board where all young people can leave questions and other messages, a Logo BBS for questions and comments on the different versions of Logo, a BASIC board for general programming comments, a PILOT board, and a microelectronics and hardware board. Exploring the system is done by single-keystrokes, each defined on a plain-English menu of choices.

The public bulletin board is open to anyone. The other services are available only to YPLA members. The host system is a 128K Apple IIe with four disk drives. Software is exchanged as text files. Those using Apple Logo will be able to run the downloaded software directly, while others may have to do some translation. As interest in the Logo information exchange develops, plans call for expansion to around-the-clock operation and toll-free service.

The Young Peoples' Logo Association is dedicated to sharing the fun and excitement of the personal computer as a creative learning center for all ages. Organized by a group of junior high students in a Richardson, Texas, garage, the organization now includes members in every state and 28 other countries. In addition to The Midnight Turtle Information Exchange, the YPLA publishes a monthly magazine and offers an extensive software exchange for all popular personal computers.

For more information on The Midnight Turtle and the Young Peoples' Logo Association, contact the YPLA, P.O. Box 855067, Richardson, Texas 75085 (214) 783-7548.

CURSOR SOUTH

Due to the tremendous success of the Great Southern Computer Shows of 1983 there will be five Great Southern Computer Shows in 1984 located in the following cities:

April 26-28–Columbia, South Carolina–Carolina Coliseum

June 21-23–Jacksonville, Florida–Veterans Memorial Coliseum

August 2-4–Charlotte, North Carolina–Charlotte Civic Center

October 11-13–Orlando, Florida–Orlando Centroplex Expo Centre

December 6-8–Tallahassee, Florida–Tallahassee-Leon County Civic Center

All shows will feature computer hardware and software, peripherals, accessories and word and data processing. Exhibits will also include office automation equipment, computer supplies, data communication equipment, telecommunication equipment, computer services/time-sharing, computer and office furniture, consulting services, environmental control, publications and more.

General Business, Vertical Market and Fortune 1000 computer seminars will be among the many workshops and seminars to be offered at all shows.

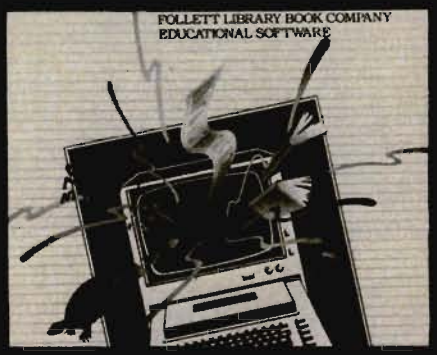
Exhibitors and attendees should contact Great Southern Computer Shows at P.O. Box 655, Jacksonville, Florida 32201 or (904) 356-1044 for registration information.

FREE EDUCATIONAL SOFTWARE CATALOG FROM FOLLETT

Crystal Lake, Illinois–Ever since its inception, educators have been raving about Follett's Quality Courseware catalog. The format and design of this personal computer software catalog is fast becoming the "bible" of personal computer users everywhere.

Follett Library Book Co./Quality Courseware maintains catalogs on a computerized data base which is updated daily. The "living catalog" grows and changes with the microcomputer industry. Current program listings include Commodore personal computers and other major brands. The company's catalogs cover over 17 subjects from administrative packages to language arts and math.

Follett customers, currently numbering over 40,000, are assured that the catalog they receive in the month they designate for the personal computer they are interested in, is the one that contains the most up-to-date quality software on the market today.



For anyone interested in obtaining a free copy of the "living catalog" produced for their machine and in the month they designate, the company says its toll free number can be utilized from 7:00 a.m. to 10:00 p.m. central standard time, (800)

435-6170. For more information, contact Don Rose, Product Manager, at Follett Library Book Company Microcomputer Division.

DON'T GO UNPROTECTED

DUARTE, CA–Hoffman Computer Products of Duarte, CA, one of the nation's leading diskette duplicators, now has the capability to provide clients with software copy protection services for Commodore microcomputers.

In announcing the new service, Roger R. Sullivan, president of Hoffman, stated, "Clients aren't often aware of the potential losses in revenues from software piracy. Copy-protection services can help to stem the tide of illegal diskette copying."

Industry analysts estimate that two to ten illegal copies of software are made for every legal copy, Mr. Sullivan explained. An estimated $36 million was lost to software producers in 1981, he said. In 1983, software producers will earn revenues approaching $2 billion. A modest estimate of losses to software piracy has to be in the hundreds of millions.

Copy protection services are currently available for diskettes in the 5.25-inch format, single or double-sided. The additional cost of copy protection ranges from 10% to 100% above the basic copying charge, depending on the copy protection format utilized. The basic charge for copying the 5.25-inch format in quantity is less than 30 cents per diskette per side.

COMPUTER KIOSKS MULTIPLY

PC Telemart, Inc., the value-added software distribution company, today announced plans for a national roll-out of its electronic search, evaluation, and ordering service for software retailers and consumers.

Beginning January 1st, 1984, installation of PC Telemart kiosks will begin on the west coast. The kiosks contain dedicated microcomputers and printers that enable sales persons, as well as software shoppers, to search among more than 30,000 packages in the data base, to locate, evaluate, and demonstrate some programs, and to order them electronically.

Following these installations, the service–which has proven itself during a two-month pilot program in the Washington, D.C. area–will spread from California to Chicago, Dallas, Fort Worth, New York, and Boston, with the opening of regional sales offices.

HOME COMPUTER GROCERY SHOPPING SERVICE

Computer Groceries, Inc. announces the start of its Home Computer Grocery Shopping Service in conjunction with Buckeye Village Market IGA in Alliance, Ohio. The service allows a shopper to order groceries through a Commodore 64 home computer and either have them delivered to their home or pick them up at the store. The shopper has a complete line of items to choose from including meats, produce, canned goods, dairy, health, and household products. The service offers over 3,000 items from which to select.

Aside from a small delivery charge there are no special charges. The entire system operates with Commodore equipment, and can be accessed by anyone with a C-64, disk drive, and modem.

For further information contact: Richard Roman, (216) 493-6974.

DOES YOUR VIC-20 TV PICTURE HAVE THE FLUTTERS?

Although the VIC-20 is designed to send out a standard TV signal for your antenna input, the electronic design of a few TV models produces an unstable or "jumping" picture on the screen. If you experience this problem, try typing

POKE 36864,133 RETURN

after turning on the computer's power. If it works, we're afraid that you'll have to do it each time you power up.

C64 GOSUB VIC-20

INTERNATIONAL INCORPORATED

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Circle No. 228

NEW PRODUCTS

These items are selected from the large number of product announcements sent to us by manufacturers and advertisers. They are presented solely as an informational service to our readers, and do not necessarily constitute product endorsements or recommendations.

INKWELL SYSTEMS INTRODUCES MODERN ALTERNATIVE TO PENCIL AND PAPER

Inkwell Systems, the creators of Penware™ products, has recently introduced FLEXIDRAW™;a versatile graphics software program coupled with a high performance light pen for the Commodore 64 computer. The FLEXIDRAW™ package enables C-64 users to perform pencil and paper routines utilizing the speed and full graphic capabilities of their computer. As a result, the C-64 user can produce from simple free-hand sketches to complex CAD-type drawings.

FLEXIDRAW™, the first in a series of Penware™ products, features a menu consisting of automatic graphic selections including: instant line (point-to-point), box, circle and rubberband choices, zoom for detailed work, two separate work areas and PUT/GET commands for manipulating images on the screen or transferring them between the two areas, and shading and pattern fills for added graphic variations.

All graphics generated with FLEXIDRAW™, can be stored on disk for later use or printed to hard copy. FLEXIDRAW™ can be easily interfaced with Commodore's 1525, Epson's MX70, the Gemini 10/10X, C. Itoh's Prowriter and the Okidata Microline. The FLEXIDRAW™ program has a full 90 day warranty.

The light pen is durably constructed and has a two year warranty. It performs well on standard TV's as well as color, black/white and most green screen monitors. Screen response time is pegged at 175 nanoseconds with a two line resolution capability.

Distributor and dealer inquiries can be directed to Inkwell Systems by calling (619) 268-8792 or by writing them at 7760 Vickers Street, P.O. Box 85152 MB290, San Diego, CA 92138. Circle No. 250

WHEN IN DOUBT, READ A BOOK

As the winter doldrums set in, learning how to use that personal computer Santa so generously provided for Christmas may begin to seem like piecing together a complicated jigsaw puzzle. To plan for those cries of "help", a variety of recommendations from Osborne/McGraw-hill may provide the "Helpware" necessary to get both beginners and experienced users quickly on line.

Your Commodore 64™, A Guide to the Commodore 64, $14.95, by John Heilborn and Ran Talbott provides easy instructions for individuals using and programming the popular Commodore 64 home computer.

Commodore 64™ Fun and Games, is a collection of games and puzzles written by Ron Jeffries, Glen Fisher and Brian Sawyer which promises hours of playful pleasures at home with a Commodore 64 computer.

VIC-20™ User Guide, $15.95, by John Heilborn and Ran Talbott offers step-by-step operating instructions to this family computer. Graphics, animation techniques, and sound are covered. Circle No. 251

THE BEST THING IN LIFE

Many of the software programs, peripherals, and accessories for Commodore computers are simply explained in an information-packed booklet. The "Everything Book for Commodore Home Computers" is for C-64 and VIC-20 owners, and describes over 500 of the latest programs from dozens of major and specialty sources. Topics include education, games, home finance, business, word processing, programming, even genealogy, and much more.

Hundreds of compatible peripherals and accessories are discussed, including joysticks, disk drives, printers, modems, interface cables, speech, monitors, recorders, and again much more.

Tenex has offered to send you the "Everything Book" absolutely *free* (a $2.95 bookstore value) if you circle the inquiry number or call toll-free 800-348-2778. Published by TENEX Computer Marketing Systems, Box 6578, South Bend, IN 46660. Circle No. 252

IS IT *THAT* TIME OF YEAR?

The 1983 edition of KSOFT's TAX RETURN HELPER should now be available. A set of 5 programs to help in filling Form 1040 and Schedules A, B, C, D and E. Data is directly entered on a screen copy of the form. The programs perform all computations and even detect some of your errors. As in an electronic spreadsheet, when you make a change, all the lines affected by it are updated on the spot. Form 1040 and Schedule A are automatically correlated. For C-64 & VIC-20 (16K) on cassette. The cost–$23 (add $1.50 s&h)–is tax deductible.

From: KSOFT, 845 Wellner Rd., Naperville, IL 60540. Ph. (312) 961-1250 Circle No. 253

GIVE YOUR FUNCTION KEYS A FUNCTION

The PROMPTER is a die-cut overlay for the Commodore 64 and VIC-20 Computer. With more and more software available that utilizes the 4 function keys on these computers, it becomes very difficult to remember what commands or information have been assigned these keys. The PROMPTER effectively and inexpensively solves the problem.

The overlay is cut from a special plastic that is flexible enough to pass through a typewriter without damage. We supply preprinted labels that are shaded to indicate the shifted function keys as well as unshifted ones.

The overlay will store either in a disk envelope along with the disk or it will ac-

tually fit inside a cassette case! By applying a blank label to the reverse side you can have CTRL cmds, SYS cmds, phone numbers or any other "often referred to" information at your finger tips.

Included are 10 overlays, 20 preprinted labels, 20 title labels, and instructions for only $5.95. Please include $.25 postage/handling, and if a California resident, $.36 tax. Circle No. 254

Send check or M.O. to:
Transierra Technology
P.O. Box 1028
Madera, CA 93639

MORE THAN A DUMB TERMINAL

The Smart 64 Terminal + 2 is a general-purpose terminal emulator for the Commodore 64. This latest version automatically adjusts to the user's disk configuration, accommodating either one or two 1541 drives or a 4040 dual drive. Print control features have been expanded to allow user-selectable line length, as well as a user-defined print command string for special functions such as condensed print on dot matrix printers.

On-line features include keyboard-controlled buffer capture, formatted end-of-line to avoid word-wrap, user-id/password sent by function key, alarm timer, screen print, four user-defined function keys–redefinable from disk, full-file upload (either continuous or line by line) from disk function key. Full support of Commodore 1650 Automodem is provided, using input from disk telephone lists or keyboard for single or repetitive dialing. Built-in direct disk commands give the user full access and control of disk usage. Files and programs any size may be uploaded and downloaded.

Off-line functions provide for the review, manipulation, and printing of downloaded (or other) files. Program conversion procedures allow for upload/download of BASIC programs and "Image" formatted programs. The user controls modem setting, printer definition, and screen colors. The Smart 64 Terminal operates either in normal 40-column mode, or in 80-column mode with appropriate cartridge.

The Smart 64 Terminal is currently used in a wide variety of communication settings for business, educational, and recreational purposes. Package includes software on disk and user guide. Suggested retail is $39.95. Circle No. 255

Available from:
Microtechnic Solutions, Inc.
230 Marvelwood Drive
P.O. Box 2940
New Haven, CT 06515
(203) 389-8383

A C-64 MUSIC OPERATING SYSTEM

Since the introduction of the computer, many disk operating systems have been developed. Entech Software of Sun Valley, California, has introduced the first music operating system for the Commodore 64, "Studio 64". This program makes creating computer music simple and enjoyable, and it allows users to add their compositions to any other program.

"Studio 64" works like a music word processor. The notes are written just as they are played, and they scroll across the screen for easy reading. The composer can play the entire composition or only sections of it at a time. Since "Studio 64" requires no programming, even a person with no prior computer experience can create complex and beautiful compositions.

"Studio 64" is also an educational program, since it teaches the relationship between how music looks and how it sounds.

The system is available on disk or cassette and sells for $39.95 each. For more information, contact Entech Software, P.O. Box 881, Sun Valley, CA 91353, or call (213) 768-6646. Circle No. 256

FOR FUN, GET SIRIUS

Well known as a prominent producer of games for that "fruit-flavored" computer, Sirius Software has recently released several products for the Commodore 64 and VIC-20.

Blade of Blackpoole is an advanced single-player adventure game with numerous puzzles to baffle and challenge players as they try to find the magical sword Myraglym. Players encounter objects which may or may not be useful in their quest and must continually make choices, meet challenges, and solve problems in order to continue.

C-64 Disk, $39.95.

Gruds in Space is a humorous single-player adventure game. Players are in search of a stranded spaceship to which they must deliver rare fuel. Using such techniques as teleporting and warp drive, players visit 110 different locations, covering most of the planets in the solar system, on their quest. The game features colorful animation sequences and the classic Sirius tongue-in-cheek humor.

C-64 Disk, $39.95.

Wayout features 26 different mazes, each with its own set of interesting quirks to the challenge of finding the way out of a maze. Drifting Fireflies show the player which way the wind is blowing–his only clue as to the direction of the exit. But he must continually be on guard against the mischievous Cleptangle, which tries to steal the compass and mapmaker that are his only hope of finding his way out.

C-64 Disk, $39.95.

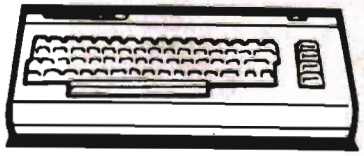
Bandits is a complex shoot-em up game with top-quality graphics. The player is guarding a lunar supply base against invading hordes of alien bandits trying to kill him and steal the supplies. Each level of the game features different kinds of bandits, each with unique strategies of attack, for a continuous challenge to the player.
C-64 Disk, $34.95; VIC-20 Cartridge, $39.95.

Plasmania simulates a voyage through the veins of a critically ill patient. The player is in a race against time as he maneuvers carefully through the veins, avoiding the various menaces that threaten his mission. Defense cells, bacteria, antibodies, and enzymes try to prevent the player from finding and destroying the life-threatening blood clot near the patient's brain.

VIC-20 Tape, $19.95.

Squish 'Em features amusing, colorful graphics and 15 level of play. As you climb a 48-story building under construction, various objects fall toward you from above–everything from bricks to the kitchen sink–and obnoxious monsters try to knock you off. You can dodge the monsters as they chase you or jump over them if you like–but it's much more fun to "squish 'em". Circle No. 257

VIC-20 Tape (8K expansion needed), $19.95. Also available on C-64 Disk.
All from:
Sirius Software, Inc.
10364 Rockingham Drive



"Reviewed in *COMMANDER*"

A MAZING ADVENTURE

Reviewed by John P. Gabbard

"Sword of Fargoal"
EPYX
1043 Kiel Court
Sunnyvale, CA 94086

I am not really sure what is is about this game that caught my attention or exactly what it is that keeps it, but I do know that I cannot seem to get enough of it.

SWORD OF FARGOAL is not a really fast-paced game, nor is it an arcade shoot-em-up game. It is, however, a challenging, very well-written graphic style adventure game.

Do not let the fact that it is an adventure game scare you away, because this is different that most that I have seen. There are no hidden tricks, no complicated riddles to decipher, and best of all, NO TYPING! That is right, no typing, in fact the only time you need to use the keyboard is to enter the single letter codes to energize one of the many different spells that are available. Everything else is controlled from the joystick.

The goal of this game is simply to find the SWORD OF FARGOAL, return to the top floor, and get out of the maze. As the game begins, a display appears that shows things such as your battle strength, experience level, dungeon level, and which spells you currently have in your posession. After a short time, this display will go away and a small man will appear somewhere on the blank screen. This little man is your character, and as you move him around on the screen with the joystick he leaves a trail which will allow you to eventually uncover the entire dungeon level that you are exploring.

Now do not think that your journey to find the sword will be an easy one. There are many "unfriendlies" such as hobgoblins, elves, guards and monks (just to name a few), to get in your way! Never fear, however, because there are also treasures, spells and gold (which is used to boost your experience level) to help sweeten the pot and help you overcome you obstacles and reach your goal.

I have played SWORD OF FARGOAL many times and have only succeeded once. The game plays extremely well and the instruction booklet explains the "rules" of the game excellently. There are even a few hints from the author on the last page to help you get started!

In my opinion, this is definitely one of the better adventure games available for your C-64 and I would recommend it to anyone who likes a challenge.

ELEGANT HOMES FOR YOUR HARDWARE

Reviewed by John P. Gabbard

"Compubenches"
SOUND EXPANSIONS
P.O. Box 53
House Springs, MO 63051

Let's see, the computer should go here, the TV goes here, the cassette should go . . . No, that won't work either, and where in the world am I going to put this disk drive and printer?

Sound familiar??? It does if your situation is anything like mine. I acquired a lot of new computer equipment over the holidays and do not have any more room in my "computer corner".

Fortunately, Sound Expansions may have engineered the perfect solutions to our "space shortage dilemma". They are called COMPUBENCHES, and there are three units available.

The first is a one-shelf unit designed especially to hold a monitor or a small TV, with the computer tucked neatly away underneath.

The second is a two-shelf unit which can be used for just about anything. You could put your cassette deck and cassettes, your disk drive, your diskettes, notes and listings or any one of a number of items.

The third is a one-shelf unit designed to accommodate your printer. It is even wide enough to hold a 15" wide carriage printer, and has a slot in it to allow for bottom paper feeding printers. There is room underneath to store printer paper or anything else you might think of.

All three units are made of solid oak and have a beautiful stained finish. After I set up the units, my small work station was transformed into a very well organized, comfortable place to work. The generous size of the units seems to be large enough to handle most any peripherals that are available for your C-64 or VIC-20.

If you are short on work space and long on computer equipment, then I would highly recommend looking into purchasing one or all of these fine pieces of computer furniture.

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EXPANDING VIC MEMORY TO THE MAX

Reviewed by John P. Gabbard

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Do you own a VIC-20? If so, you have probably realized by now that 5K is just not enough memory to do much of anything with, especially when the system itself uses over 1K for various things. Unfortunately, it is not an easy task to permanently add more memory, the computer was not designed with permanent expansion in mind. Instead a user expansion port was included, this expansion port is set up to handle just about anything that you would ever want to plug into it, including the memory!

More memory, that is what it is all about, or is it? If we get a normal memory expansion cartridge, it will completely tie up the expansion port and would not allow us to use a ROM based cartridge (such as monitor or a word processor) at the same time! One possible solution is to also purchase an expander board of some type that would turn your one expansion into four or five. This solution, however, is not without drawbacks, since expander boards are usually quite large and extend a fair distance out of the back of your computer making it very difficult to find enough space for your computer to live. Expander boards are also an added extra expense; they provide you with many more user ports, most of which will never be used by the average person. So then what, you ask, is the solution?

Well, I am sure that there is no perfect solution, but I think I have found one that is close, it contains 32K of DYNAMIC RAM, an extra expansion port, user option switches, and only sticks about 4 inches out of the back of ther computer. The name of this lifesaver is RAMMASTER 32 from Mosaic Electronics.

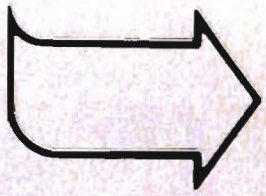
As I mentioned before, it comes with 32K of dynamic RAM. This is a maximum value; it is possible (through the use of user option switches) to select or deselect any or all of this RAM in blocks of 8K at a time. In addition to being able to select your RAM, you can use the option switches to make the selected RAM appear to be ROM or to pause the execution of the program at any time. There is even a reset jumper that you can use in case you need to reset the computer without losing your program. Refer to Figure 1 to see how each switch affects the memory map.

Over the past few months, I have used RAMMASTER 32 quite extensively and so far it has been able to meet all of my needs without even a hint of a problem. The documentation is very well written, easy to follow and has many examples and pictures to help give you a clear understanding of how to use it. It also has one of the best guarantees that I have seen in a long time; it states:

> "IF THE RAMMASTER 32 SHOULD EVER FAIL TO OPERATE PROPERLY WITHIN FOUR YEARS FROM THE DATE OF PURCHASE, SHIP IT TO THE FACTORY AND MOSAIC WILL EITHER REPAIR OR REPLACE IT FREE!"

It is really nice to see a company that believes in the quality of their product to such a degree that they can offer a guarantee like that.

The purchase price for the RAMMASTER 32 is $129.95, and well worth every penny of it in my opinion.



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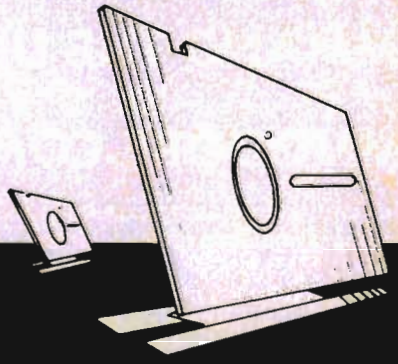

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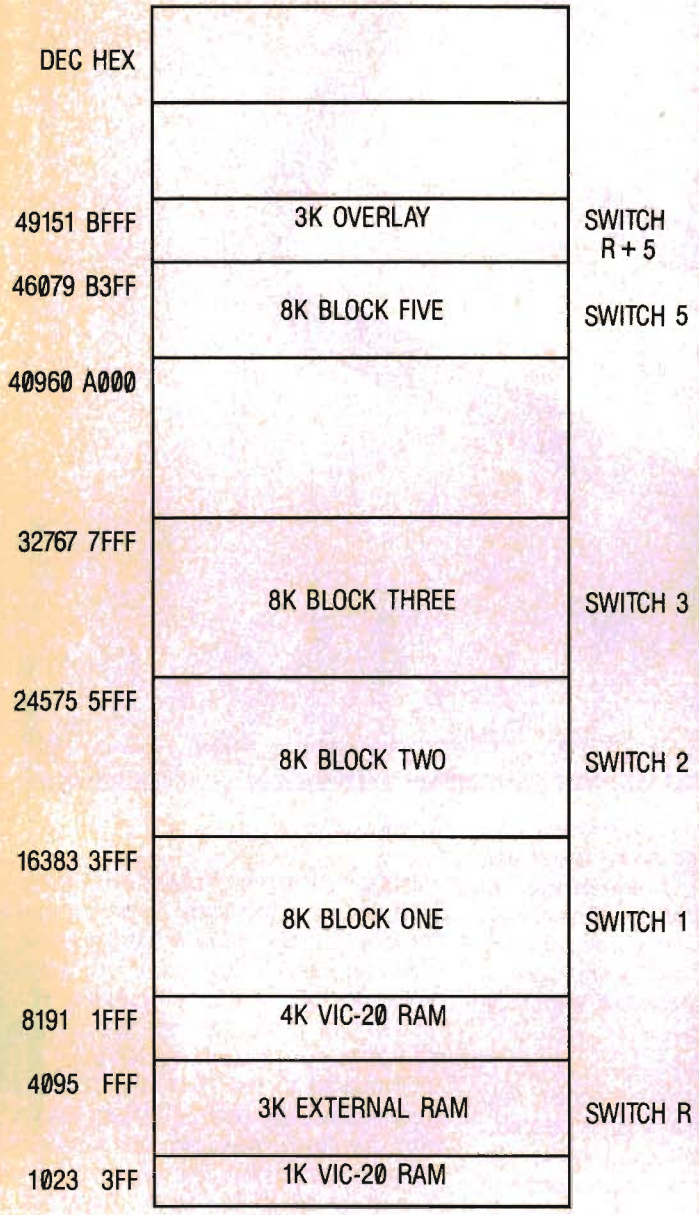
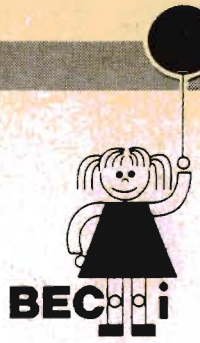
FIGURE 1



SWITCH#	LABEL	FUNCTION
1	1	BLOCK 1 ON/OFF
2	2	BLOCK 2 ON/OFF
3	3	BLOCK 3 ON/OFF
4	R	3K EXTERNAL ON/OFF
5	5	BLOCK 5 ON/OFF
6	W	WRITE PROTECT ON/OFF
7	X	EXPANSION PORT ON/OFF
8	P	PAUSE CONTROL ON/OFF



C-64 VIC 20 ATARI

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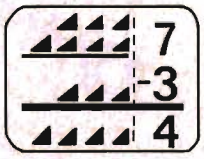

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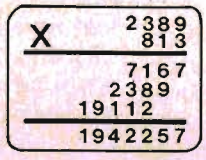

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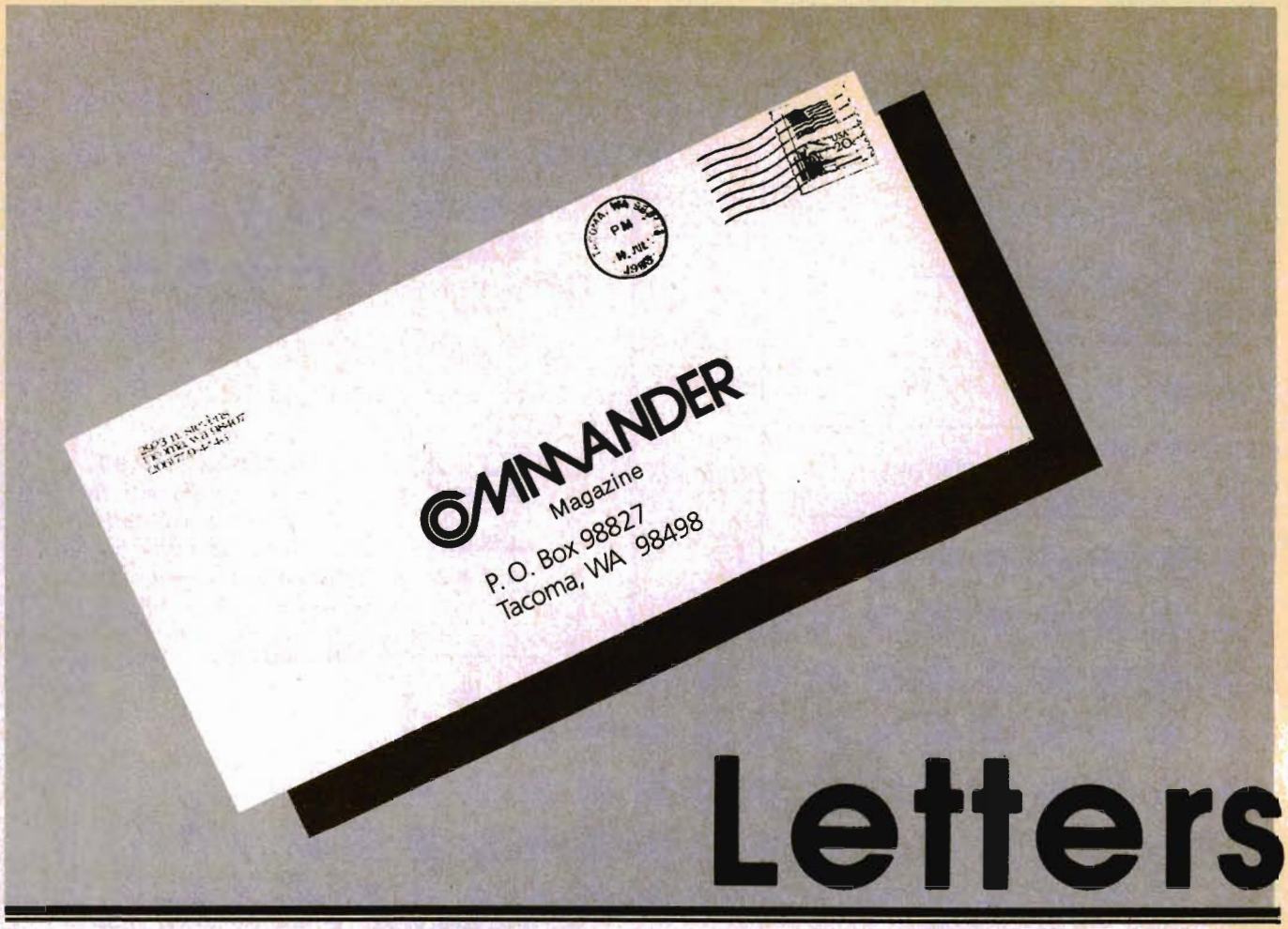

Letters

To Colin Thompson:

I have been following your reviews in *COMMANDER* and have enjoyed them since you started writing them.

In the November issue, however, I couldn't help but notice how close your disks are to your monitor. Isn't that a little close? What I mean is, won't the magnetic fields from the TV monitor have an effect of erasing some of the data, especially the magnetic field created by the degausing coil when the set is first turned on?

I also noticed that your cassette deck is located near your TV monitors. How do you keep from getting LOAD/SAVE errors? The instructions that came with mine said to keep it at least two feet away from the TV monitor. When I tried to move it closer, I did experience LOAD errors about 75% of the time. Is there a secret?

EWM
VIC-20 Owner

Dear EWM:

Thanks for your letter and the kind words about my column. Your questions about the placement of my hardware are valid. Do I have a secret? No. I have three full blown VICs, two in my home and one in the office. With all this hardware, I've never had a disk problem that could be traced back to electro-magnetic interference. My Commodore drives and the MSD drive seem to be impervious to placement related problems. The photos that were published in November were staged to show off the Grayline racks. In actual use, the equipment might be anywhere on the table.

To erase the disk with a magnetic field requires a strength of at least 50 oersteds. That roughly equates to placing the diskette directly on the casing of a one-half horsepower electric motor. Also remember that the diskette, when housed inside the Commodore drive is protected by a lot of metal. I would guess that is the reason I never have those problems.

However, the cassette drive is another subject. My datasette is so unreliable that I only resort to using it about once a month. Then I place it as far away from the computer and monitor as possible. The position of the cable seems to affect the performance also. Reams have been written about the datasette problems. I don't care to experience tape problems, so I use the disk drive instead.

I hope this clears up your questions.

Colin

To the Editor:

This letter is in response to Colin Thompson's review of the Micro-Systems Development DS1 disk drive in the December 1983/January 1984 issue. In early November both my 1541's broke down. MSD's dual drive was not yet on the market, so I purchased two SD1's.

Compared to the 1541, the SD1 is a dream. SAVE"@: and OPEN"@: always work flawlessly, disks are formatted in eighteen seconds flat, and validating goes at least twice as fast as on the 1541. Changing my second 1541's device number to 9 meant wearing out my arm sawing a connector; on the SD1 I had only to slip off a jumper and place it on an unused pin, safe from loss if ever I want to slip it back on to make the drive #8 again. Try changing a 1541's number back in hardware; you need to resolder what you sawed. It's been suggested to tape down a piece of paper clip, but the tape is likely to burn.

There are a few things I want to add to Mr. Thompson's review. First, I have an IEEE-488 interface, and it is about five times as fast as the serial bus. It's hard to say, because the 64, BASIC, and the DOS have their own tasks at each end regardless of what connects them. I do know

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Price Retail	$29.95	$49.95	$59.95
Software	User friendly (19 descriptive error messages). 30 k left for programming.	User friendly (23 descriptive error messages). 21-29 K left for programming.	Not user friendly (cryptic one-letter error messages). 12 K left for programming.
Manual	124 pages Tutorial (Hands on, beginning with the very basics). Many examples. Good for novice & experienced programmers.	220 pages* Tutorial (hands on, beginning with the very basics). Many examples. Good for novice & experienced programmers.	111 pages Written as a reference manual. Few examples. Good for experienced programmers.
Turtle	Yes, true Turtle Graphics can face turtle any of 360°. Lo resolution.	Yes, two Turtle Graphics modes each can face turtle any of 360°. Hi and lo resolution.	No, not true Turtle Graphics (Lines drawn require beginning and ending points). Hi resolution only.
Sprites	No	Yes, Built-in Sprite editor. Allows interactive development.	Yes, but the actual sprite can't be seen until program is RUN.
Editing	Edit any line at any time after listing. Resident screen editor fully utilized. Global features include FIND, CHANGE, RENUMBER.	Same as Vanilla Pilot.	One line at a time - in edit mode only. Resident screen editor not fully utilized.
Debugging	Both immediate and deferred mode trace.	Same as Vanilla Pilot.	None.
Program Code Protection	None.	STUDENT command locks the program code.	Separate Run-time module.
Variables	26 Numeric variables. 2 strings. No system variable.	26 Numeric variables. Allows 8 characters string names (over 22 billion possibilities) 9 system variables. * Estimated as of October 20, 1983. Final count may vary slightly.	26 Numeric variables. Limited to 26 strings because of character string name. 1 system variable.

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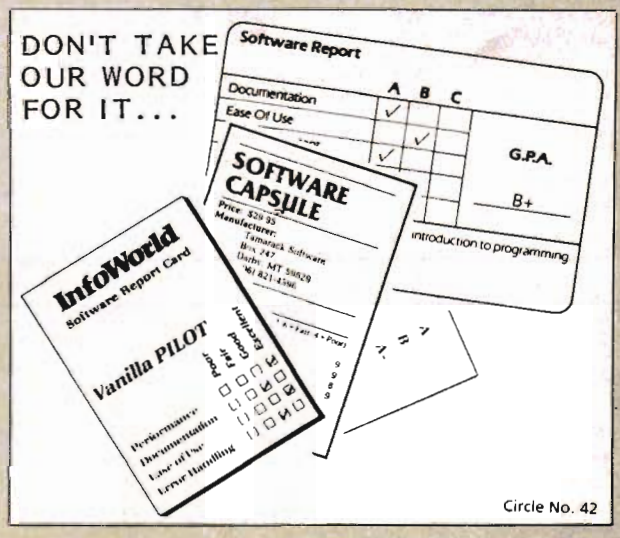

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that copying a disk with one free block, a twenty-eight-minute drudgery with the 1541 Backup, took 19-1/2 minutes with Copy-all on the SD1 serial bus; on the IEEE bus it took 11-1/2 minutes. Another disk with one free block but fewer files took only 9-1/2 minutes, because the DOS spent less time creating files. The block counter just flies past when you use the IEEE bus.

Second, in September MSD revised the ROM in the drive. Inadvertently, the device number was relocated from $0077-0078 to $0075-0076. If you have an SD1 whose serial number ends in AC, the software device number change on p. 37 of the manual will work only if you change CHR$(119) to CHR$(117). MSD is considering offering an exchange of ROMs, but the problem is minor.

Third, because the drive has more memory than the 1541, it is organized differently. Almost all software operates without modification, but programs that use disk memory locations will be surprised if they expect to find a 1541. Some software companies may exchange your disk if you tell them you have an MSD SD1.

I hope other readers find this information helpful. MSD certainly has a satisfied customer (and *Commander* a satisfied subscriber) in me.

DWT
Chicago, IL

●

To the Editor:

I am in need of a program written for Commodore 64 and designed to handle attendance accounting for a school of 250 students.

There are ample such programs available for other brands of computer, but, to date, I have not been able to locate one to be used with our hardware.

Any assistance you can give us in this matter would most certainly be appreciated.

RLI
High School Principal
Hayfork, CA

●

To the Editor:

We just subscribed to your magazine because we own a Commodore 64. We were impressed with the Christmas greeting program. It's a lot better than getting a Christmas card!

Another reason we subscribed is because of your great articles and programs.

BC
Greenfield, WI

ReCommand

UPDATES, CLARIFICATIONS AND CORRECTIONS TO PREVIOUSLY PUBLISHED MATERIAL

BACK ON THE ROAD

The "Road Race" game for the VIC-20 in our Anniversary Issue (Vol. 2, Issue 1) had one program line which could use some deciphering due to a stray reverse-graphic control character (see Key-Mander in this issue). On page 107 of the listing for Road Race, line 160 should read, according to our *current* listing format:

```
160 PRINT"[home] [grn] [down] [left]
  [inst] [sp]";:POKE218,158:PRINT
  A$(F2):LC=LC+P1
```

EDIT/ASM UPDATE

According to our writer/programmer, Eric Giguere, the following changes should correct or improve the performance of his EDIT/ASM editor/assembler program, which was published in sections during 1983. In the Editor Module (*COMMANDER*, June 1983, page 73), line 310 should read:

```
310 PRINT#3,L
```

Also, the Assembler Module (*COMMANDER*, August 1983, pages 99-106) can be updated with the lines listed in Figure 1.

GIVING CREDIT WHERE IT IS DUE

In our September 1983 issue, the review on pages 137-138 of Tyler's Dungeons, distributed by Creative Equipment, neglected to mention that this game was programmed by Gregory Pratt, president of Turbo Software, Inc.

FIGURE 1

```
The following lines in the Assembler listing should be changed or added:

2680 OPEN3,1,2,OF$:GOTO2710

2715 DV=OO-INT(OO/256)*256:PRINT#3,CHR$(DV);CHR$(OO/256);

3145 C$=MID$(A$(O),SP(1)+1):X=LEN(C$)-2:IFX<1THEN3240

3155 C$=MID$(A$(O),SP(1)+1):X=1:FORI=1TOLEN(C$):IFMID$(C$,I,1)="."THENX=X+1

3185 IFX$="X"THENIFMID$(C$,LEN(C$)-1,1)=","THENXX=1:GOTO3205

3190 IFX$="Y"THENIFMID$(C$,LEN(C$)-1,1)=","THENY=1:GOTO3205

3220 V$=C$:GOSUB5000:C$=V$:IFLEFT$(B$,1)="B"THENT=9:GOTO3235

3225 F=0:FORI=1TOSY:IFC$=S$(I)THENIFV(I)+AD<256THENOR=0:F=1:I=SY+1

3232 IFT=1ANDLEFT$(B$,1)="J"THENT=5

3245 IFOD=1THENDV=PC-INT(PC/256)*256:PRINT#3,CHR$(DV);CHR$(PC/256);

3582 IFLEN(HX$)<5THENPRINT#4,"  ";

5010 Z$=RIGHT$(V$,1):IFZ$="","ORZ$=">"THENV$=LEFT$(V$,F):GOTO5005

5011 IFZ$<>"X"ANDZ$<>"Y"THEN5015

5012 IFMID$(V$,F,1)=","THENV$=LEFT$(V$,F):GOTO5005
```

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Review of PAL

Continued from page 101

2. From personal experience, this is devastating, as the wrong address gets assigned to subroutines and it's soon time to power down and scratch your head. This is insidious because of the difficulty in identifying the source of the problem. Thankfully, a conditional expression is given in the manual to recognize when it has happened. The phase error is more likely to occur in tables of byte or word values or in strings of ASCII text. Use of closing quotes on all such strings is highly recommended. Another frequent user pointed to a comma in a text string as the source of his phase error. The C-64 version does include a comment, repeated here, that all zero page references must be defined before being used. (This was not the cause in my case.) The wise will *always* include the precautionary expression just in case.

When tables of reserved memory locations are produced, the displayed listing shows the "wrong" address of the label. This too is documented in the manual, explaining that the program counter has been updated before the listing is printed. Thus the actual value of the label is *not* the value alongside it. You'd best remember this one too.

The assembly listing does not automatically generate a sorted symbol table. You must save the table as a file and use it as input to the SYMPRINT utility. Output of the assembly listing is not paginated, which may be a blessing to those without the "right" printer connected. I turn on paging in the BASIC part of the listing, before calling the assembler. There is a utility called PAGINATE which can handle this output to an ASCII printer.

CONCLUSIONS

I have no reservations in using PAL for 100% of my needs. The use of "BASIC" text files, the speed, in-memory assembly, direct production of usable object-code and the tremendous variety of built-in features is unmatched.

Brad wrote PAL in 1979 and used it in the development of several commercial packages. Only a handful of people had access to it for the first three years, although those who did would not do without it. In my view, if it had been released then, it would have become the de facto standard assembler for the Commodore community. Instead, we have a latecomer of a package, trying to penetrate a fairly crowded market. For myself, I bought three assemblers prior to obtaining PAL. Perhaps the Commodore 64 market will offer the widespread distribution opportunity that was missed earlier. PAL gets my vote of confidence as a fine product.

INTRODUCTION TO ASSEMBLY LANGUAGE

THE END OR THE BEGINNING?

Continued from page 37

This may be the end of "An Introduction to Assembly Language" but it should not be the end of your learning experience. Learning is something that never ends, and you should explore with the computer whenever you can. I won't leave you alone to explore, either. The interest generated by this column has led me to broaden my horizons. Look for my new column "Explorations With Assembly Language" in future issues of *COMMANDER*. Not simply a continuation of this column, it will explore a different facet of assembly language every month. We're going to look at everything from graphics to the BASIC and KERNEL ROM routines. I invite you, readers, to suggest topics you'd like to see discussed. After all, this is YOUR magazine and we'd like you to make the most of it. Next month we begin our first exploration with my presentation of the program "DIS/MON", a disassembler/monitor written in BASIC to be used in future columns.

In wrapping up this series I'd like to thank the staff at *COMMANDER*, and especially my readers, for making this column such a success. I look forward to receiving your comments and suggestions. If you have anything to say or ask you can contact me through *COMMANDER* at the following address:

Eric Giguere
COMMANDER Magazine
P.O. Box 98827
Tacoma, WA 98498

Please be prepared to wait at least 4-8 weeks for an answer as the letters have to be forwarded on to me in Canada (and you know how fast the postal system is!). Be sure to include your return address on the letter itself in case the envelope is lost. Until next month, then, . . .

Continued from page 26

tain software programs and/or hardware adaptations. For both computers, you must pay for these additions.)

PRICING A CONCLUSION

After all the options have been weighed by the consumer, the bottom line remains price. Are you willing to spend $200 for a 64K RAM computer or $669 for a 64K RAM computer?

In other words, to get really started on a PCjr, (excluding printer) you need: (1) The PCjr Entry Model which includes a cordless keyboard, 64K user memory, two cartridge slots, and transformer for $669; (2) IBM PCjr Diskette Drive 360KB for $480; (3) DOS 2.10 (essential for compatibility) for $65; (4) IBM Extended BASIC Cartridge for $75; (5) IBM Pcjr TV adaptor $30–TOTAL $1,319.

However, IBM feels that the most popular system for the family home will be: (1) The IBM Pcjr Expanded Model which includes 128KB user memory (including 64KB memory and Display Expansion), Disk Drive, two cartridge slots, cordless keyboard, and transformer for $1269; (2) DOS 2.10 for $65; (3) IBM Extended BASIC Cartridge $75; (4) TV Adaptor $30; TOTAL $1,439.

Now we come to the Commodore 64 system: (1) The Commodore 64 computer keyboard 64K RAM user memory, one cartridge slot, built-in BASIC, transformer (ready to hook-up to TV) $200; (2) 1541 Disk Drive 170KB $299–TOTAL $499.

Commodore speculators believe that with the introduction of the IBM PCjr, the computer market will soon show a clear economic split between those who are willing to pay for the IBM, and those who prefer to buy an inexpensive home computer and work from that relatively self-motivated investment.

COMMANDER 64 AND HIS SIDEKICK, VIC

One day, Commander 64 and Vic were sitting at their keyboards when the red power light started flashing and an ominous tone came from the TV speaker. "The error alert!" said Commander 64. A sneaky error alert, right?!"

Quickly Vic typed in "WHERE?". The screen then displayed an unfamiliar address. Immediately they streaked off. When they arrived at their destination, a man was screaming for help. They rushed in.

"Boy, am I glad to see you!" said the man. "I keep getting a syntax error whenever I run this program. Like to see?"

"Yes, of course," said Commander 64. He went to the computer and typed "LIST 1Ø". The screen showed this:

```
1Ø PØKE 36879,8:PRINT "HI";
```

After puzzling over it for a few seconds, Commander 64 said, "Vic, do you have an idea?"

"Sure," said Vic. "That Ø in the word POKE should be an 0. He cursored up to the line and changed the problem character. Then he typed "RUN". Instantly, the screen filled up with HI's.

"Thanks," said the man. Commander 64 said "Anytime," as he and Vic pressed RETURN and streaked HOME to continue their struggle against bugs, crashes, and those dreaded infinite loops.

Key-Mander

HOW TO TYPE IN BASIC PROGRAMS FROM *COMMANDER* MAGAZINE

As you probably know, your computer has a limited vocabulary and responds to BASIC language instructions in an extremely literal way. Programs listed in *COMMANDER* are carefully pretested, and should run as intended on your computer if they are copied properly. The following guidelines should help to clarify some important points about entering programs through the keyboard.

WRAP AROUND

Every "line" in a BASIC program begins with a line number and ends when you press the [RETURN] key. If a line in the program contains more characters and spaces than can fit on the width of your screen, just keep typing and the computer will automatically continue on the next row of the screen. You should press [RETURN] *only once* before starting the next line number. A 40-column C-64 or PET will "wrap-around" a program line for no more than 2 screen rows, with a maximum of 80 characters per program line. The 22 column VIC-20 can wrap around up to 4 rows (88 characters) in a program line.

SPACES

In a BASIC statement, spaces are usually ignored by the computer but may be added by programmers to increase readability. However, when the "quote mode" is in effect (see below), spaces do count. Unless you have good reason to do otherwise, it is probably safest to type spaces as they appear in our listing. Please note, however, that wrap-around lines will *not* be indented on your screen the way they appear in our published listing.

PUNCTUATION

Pay careful attention to punctuation symbols. You may not think there's much difference between a colon and a semicolon, but the computer certainly does. All commas, parentheses, and other special characters should be faithfully copied.

PLEASE NOTE: For technical reasons, quotation marks are listed as a double apostrophe. When you see that, press [Shift-2] for the quotation mark symbol.

ONES AND ZEROS

Among the most common errors of beginners (and even experts) is confusing the numbers 1 and Ø with the letters I, L, and O. You may have learned to type a lower case L for 1 on a typewriter, but most computers will not allow it. In our listings, pay close attention to the shape differences between the numbers 1 and Ø and the similar letters, I and O.

SAVE IT WHEN YOU CAN

It is wise to SAVE a program on tape or disk before running it. That way, if the computer "locks up" or becomes inoperative because of an error, you won't have to re-type everything. For a very long program, it is advisable to save what you have entered after every 20 or 30 minutes of typing.

THE "QUOTE MODE"

Most Commodore computers incorporate an extremely useful, though tricky, feature called the Quote Mode. This allows you to program screen control functions, including cursor movement and character color changes, within a PRINT statement. Quote Mode is turned on whenever the quotation mark key [shift-2] is pressed. It is turned off when the quotation mark key is pressed again, or when the [RETURN] key is pressed. Quote mode is also in effect whenever the insert (INST) function is used.

When the quote mode is *on*, any time you press either a cursor control key, a color control key (such as [ctrl-wht]), or a reverse control key, you will see an inversed graphic character appear on your screen. These characters have no obvious meaning by themselves except as indicators that certain control functions have been inserted in the program. These inverse graphic characters also appear in normal, hard-copy (paper) listings of a program, but are nearly impossible to interpret in that form.

THE *COMMANDER* "QUOTE MODE" LISTING FORMAT

To make your task as easy as possible, *COMMANDER* has adopted a unique format for all control and graphic characters, as well as spaces, that occur between quotation marks. In our listing, each special character is represented by an abbreviation that appears between a pair of square brackets. For example, [down] means to press the cursor-down key once. The abbreviation [com-G] means to hold down the Commodore logo key (at the far lower right of the keyboard) while pressing G. When you see [shf-W], hold the shift key and press W. The space bar is indicated by the symbol [sp]. When the same special key is to be pressed more than once, the number of repeats will be shown between the brackets, for example, [right, 8 times].

Here is a list of the most common special key abbreviations:

Abbreviation	Key(s) to Press
[blk]	CTRL & 1
[wht]	CTRL & 2
[red]	CTRL & 3
[cyn]	CTRL & 4
[pur]	CTRL & 5
[grn]	CTRL & 6
[blu]	CTRL & 7
[yel]	CTRL & 8
[rvs-on]	CTRL & 9
[rvs-off]	CTRL & Ø
[clr]	SHIFT & CLR/Home
[home]	CLR/HOME
[inst]	SHIFT & INST/DEL
[down]	CRSR ↓
[up]	SHIFT & CRSR ↓
[right]	CRSR →
[left]	SHIFT & CRSR →
[shf-X]	SHIFT & X(or any key indicated)
[com-X]	Commodore (lower right key) & X (or any key indicated)

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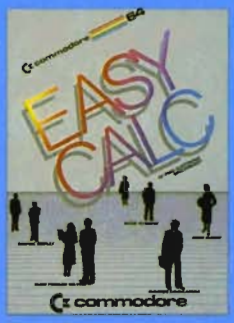

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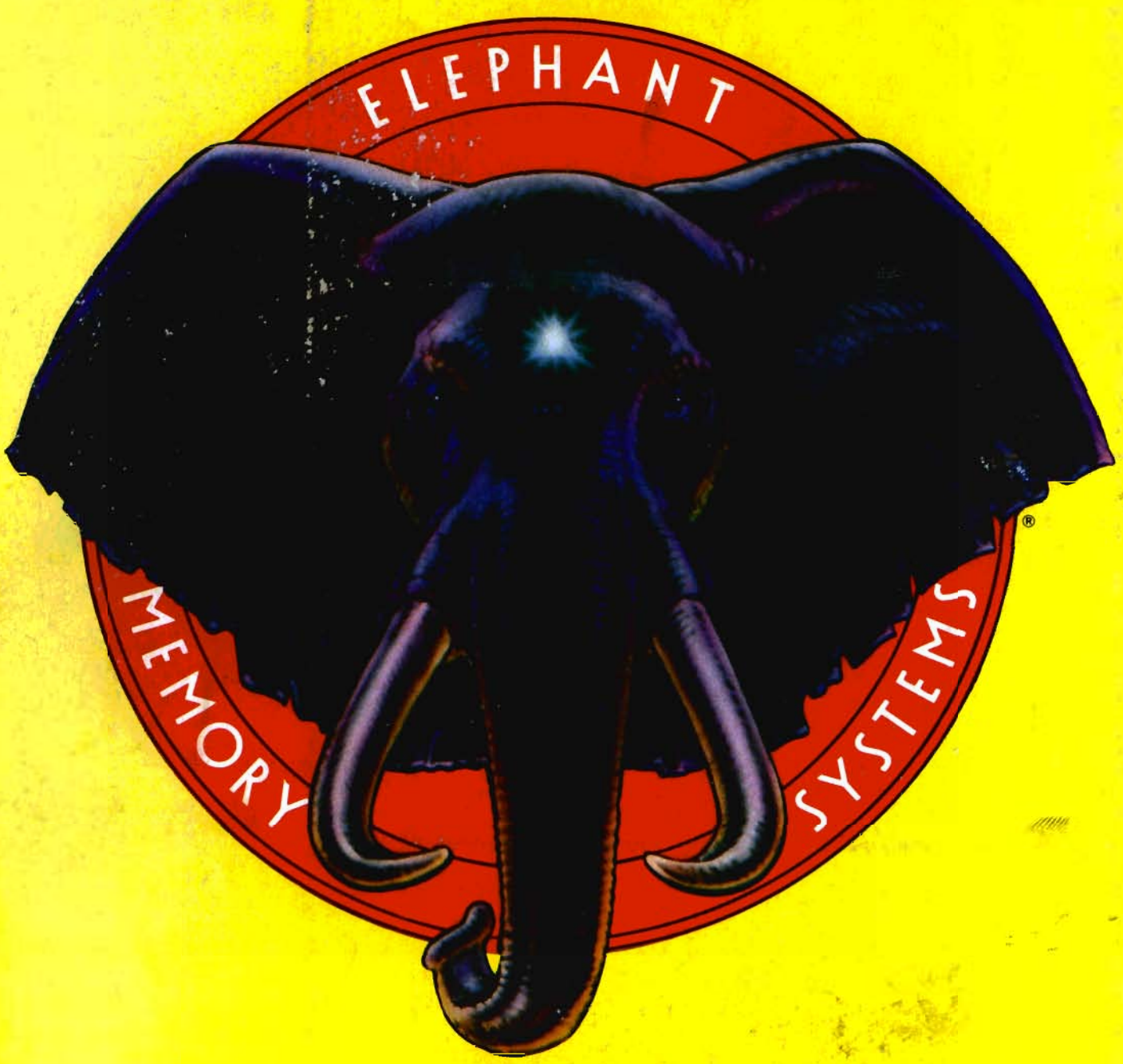

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